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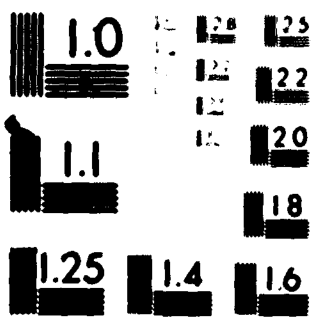
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AIR FORCE HUMAN RESOURCES LABORATORY

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TECHNICAL ORDER MANAGERS
REFERENCE DATA

By

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LOGISTICS AND TECHNICAL TRAINING DIVISION
Logistics Research Branch
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Final Report

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This report was submitted by BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Virginia 22042, under Contract F33615-78-C-0016, Project 1710, with the Logistics and Technical Training Division, Air Force Human Resources Laboratory (AFSC), Wright-Patterson Air Force Base, Ohio 45433. Robert C. Johnson, Personnel and Training Requirements Branch, was the project engineer. Contract technical monitors were SMSgt Edwin G. McFall and, later, SMSgt Robert Guy.

This report has been reviewed by the Office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

ROSS L. MORGAN, Technical Director
Logistics and Technical Training Division

RONALD W. TERRY, Colonel, USAF
Commander

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format selection	Job Performance Aids (JPA)	TO procurement
format test and evaluation	Logic Tree Troubleshooting Aids (LTTA)	troubleshooting procedures
FORDEC	maintenance procedures	validation/verification

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In past years, research by Air Force and other DOD agencies has resulted in the development of several more effective techniques for developing and for presenting technical data for maintenance. Application of these development techniques and improved presentation formats for operational use has been hindered by the fact that technical data managers frequently do not have sufficient information available on the improved techniques and formats to allow them to select and procure the improved data. The guidelines developed by this effort can be used by personnel who develop technical data for the Air Force and by those who manage such efforts. A thorough review of the state of the art in developing, presenting, and procuring technical data was accomplished to provide the basis for developing the guidelines. This was accomplished first by reviewing available formats, specifications, and applicable

Item 20 (Continued):

literature and by then conducting extensive interviews with government and industry personnel who are knowledgeable of, and experienced in, current technical data procedures. The next phase involved analysis of these data, the selection of candidate formats, the development of descriptions on the formats, development of criteria for selecting formats and development of guidelines for procuring data.

This report can be used as a basic reference publication by all individuals involved in Acquisition and Management of Air Force Technical Orders. The report provides the following information: developments in procedural data formats, job performance aid concepts and techniques, format test and evaluation, and format option selection data. The report also contains a comprehensive listing of requirement and guideline documents which are available for use in the preparation and acquisition of technical manuals and related data. A military specification and military standards cross-reference table is provided for quick reference to specific information.

PREFACE

This report has been prepared by BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Virginia 22042. It is the culmination of work accomplished for the Logistics and Technical Training Division, Air Force Human Resources Laboratory (AFHRL), Wright-Patterson AFB, Ohio, under contract F33615-78-C-0016 during the period May 1978 to May 1980.

The authors express their appteciation to SMSgt Edwin G. McFall and his successor SMSgt Robert Guy, both of AFHRL, for their support and guidance during the performance of this effort, and to Robert C. Johnson, AFHRL, for his patient consultation and knowledgeable direction. Acknowledgement must also be made of the contributions of the many individuals in the Air Force, the other military services, and in industry, who shared with the authors their expertise and experiences of developing and acquiring technical publication data.

The BioTechnology Program Manager for this effort was Harold E. Price, and G. Richard Hatterick was Principal Investigator. The authors are also indebted *to Theodore* J. Post of BioTechnology for his consultation and advice regarding procedural data formats.

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SECTION 1. GLOSSARY OF TERMS

This glossary contains definitions and explanations of terms used by the military services and their contractors. It is oriented primarily to the needs of those individuals involved in the acquisition, development, and utilization of Air Force Technical Orders and similar materials of the other military services. Most of the definitions are compatible with usage in all services. Some are attributable to a particular service, and are so identified in parenthesis at the end of the definition: e.g., (AF): Air Force
(N): Navy
(A): Army.

Those definitions that reflect the usage found in one or more of the official TO System publications (AFR 8-2, TO 00-5-1, TO 00-5-2, and TO 00-5-15) have a "bullet" preceding the source notation, e.g., (●AF). If the definition also has equivalent usage among the other services, this will be noted with an "M" for Multi-service, e.g., (●AF; M).

Abbreviations and acronyms are defined in Section 2. Job Performance Aid (JPA) techniques are listed in Section 4.

A

A PAGE. The A page follows the title page and contains a list of effective pages or figures (i.e., the pages or figures that are in effect after changes have been made to the manual. An A page can also be a list of effective Work Packages (WP).

ABBREVIATED TECHNICAL ORDER. A type of TO which is primarily a work-simplification device such as a checklist, inspection workcard, lubrication chart, or sequence chart. (●AF)

ACQUISITION LIFE CYCLE. Normally consists of five phases (Conceptual, Validation, Full-Scale Development, Production, and Deployment) with three key decision points (Program, Ratification, and Production Decisions) between each of the first four phases. These phases explain the normal acquisition path, not a prescribed path which all programs must follow. A program may skip a phase, have program elements in any or all other phases, or have multiple decision points per phase.

ADDITIVE REQUIREMENTS. Those requirements which are not supported by actual past demand experience and are added to the reorder level.

ADJUST ALIGN TRIM. To bring within specified limits the variable elements of an item.

ADMINISTRATIVE LEAD TIME (ALT). The time interval between initiation of procurement action and letting of contract or placing of order.

ADVANCED DEVELOPMENT. Includes all projects which have moved into the development of hardware for experimental or operational test.

AEROSPACE GROUND EQUIPMENT (AGE). All equipments required on the ground to make a weapon system, command and control system, support system, advanced objective, subsystem, or end item of equipment operational in its intended environment. This includes all equipment

required to install, launch, arrest, guide, control, direct, inspect, test, adjust, calibrate, appraise, gauge, measure, assemble, disassemble, handle, transport, safeguard, store, activate, service, repair, overhaul, maintain, or operate the system, subsystem, end item, or component. This definition applies regardless of the method of development, funding, or procurement. Aerospace ground equipment is functionally subclassified as *operating ground equipment* and *maintenance ground equipment*. (See SUPPORT EQUIPMENT for more current terminology.) (AF)

AEROSPACE VEHICLE EQUIPMENT (AVE). Aerospace vehicle equipment consists of the operational flight vehicle and all its flight components. (AF)

AGENT. The military service which provides supply maintenance support to other military service(s) or government agencies (the principal(s)).

AIR FORCE TECHNICAL ORDERS STANDARDIZATION BOARD (AFTOSB). This board functions to provide guidance and direction to the Central Technical Order Control Unit (CTOCU) and provides final decision on controversial and/or conflicting matters that cannot be resolved by the CTOCU. This board is normally located at the same place as the CTOCU. It is composed of one representative from each of the following: Air Force Systems Command (AFSC), Air Force Logistics Command (AFLC), and using command(s). (AF)

AIR LINE WIRING DIAGRAM. A method of presenting wiring data of more than one microfilm frame so that wires crossing more than one frame are eliminated. (N)

ALLOCATED CONFIGURATION IDENTIFICATION (ACI). Current, approved, performance oriented specifications governing the development of configuration items that are part of a higher level configuration identification (CI), in which each specification: (1) Defines the functional characteristics that are allocated from those of the higher level CI, (2) Establishes the tests required to demonstrate achievement of its allocated functional characteristics, (3) Delineates necessary interface requirements with other associated configuration items, (4) Establishes design constraints, if any, such as component standardization, use of inventory items, and integrated logistic support requirements.

ANALYTICAL OVERHAUL. The complete disassembly, inspection, engineering evaluation, repair, assembly, and test of military materiel either in or entering the inventory for the purpose of refining requirements for spares and repair parts, maintenance technical criteria, tooling, test equipment and technical data, and/or determining the need for product improvement. (AF)

APPROVING AUTHORITY (AA). The activity having technical approval authority for specific requirements items; the AA may also generate a demand through the contracting officer.

ASSEMBLY, INSTALLATION AND CHECKOUT TECHNICAL ANALYSIS (A&COTA). The A&CO technical requirements analysis is the discipline and/or technique of identifying and reporting the requirements for A&CO, as specified in the contract. The end result of this analysis is the establishment of requirements for design and development of procedures, timelines, drawings, assembly/checkout equipment, and operations and maintenance manuals. (AF)

ASSOCIATE CONTRACTOR CLAUSE. A contractor clause which gives authority to the prime system contractor to specify changes to the Government-furnished equipment (GFE) in order to ensure compatibility with the system/equipment.

AUTHORIZED DATA LIST (ADL). A master list of Data Item Description (DID) forms from which data requirements must be selected for contractual application.

AUTOMATIC DATA PROCESSING (ADP). Use of computer equipment to process TO requirements and related data, and compile system products. (● AF; M)

AUTOMATIC TEST EQUIPMENT (ATE). Electronic support equipment (SE) devices capable of automatically or semiautomatically generating and independently furnishing programmed stimuli, measuring selected parameters of an electronic, mechanical, or electromechanical item being tested, and making a comparison to accept or reject the measured values in accordance with predetermined limits. ATE may also include independently configured automatic or semiautomatic devices which are capable of detecting, measuring, and evaluating electrical/electronic or electromechanical characteristics of systems/equipment. ATE is normally operated by use of previously prepared test software recorded on punched tape, card decks, magnetic tapes, disc pac, or other storage medium.

AUTOMATION TYPE TO. Formerly, a type of technical order (TO) furnished as punched tapes or cards or as magnetic tapes that are used to operate and maintain automatic data processing systems (airborne and ground computers and automatic test equipment). They are no longer encompassed by the TO System. (AF)

AVAILABILITY. The measure of the readiness of an item to perform its required function at any instant of time within a stated interval of time under stated conditions of use. The fraction of total time during which an item is in a specified operable condition. Availability is considered to be synonymous with operational readiness.

AXIS LINES. Axis lines are the broken lines that are used to indicate component connections.

B

BASE LINE. A configuration identification (CI) document or a set of such documents formally designated and fixed at a specific time during a CI's life cycle. Base lines, plus approved changes from those base lines, constitute the current configuration identification. For configuration management there are three base lines:

1. ALLOCATED BASE LINE. The initial approved allocation configuration identification.
2. FUNCTIONAL BASE LINE. The initial approved functional configuration identification.
3. PRODUCT BASE LINE. The initial approved or conditionally approved product configuration identification.

BASE PERIOD. That period of time for which factors were determined for use in current planning and programming.

BENCH CHECK. A physical inspection or functional test of an item removed for an alleged malfunction, to determine if the part or item is serviceable or repairable. It also includes a determination of the extent of maintenance or repair and possible overhaul required to return it to serviceable status.

BLUEPRINTS, BLUELINE PRINTS. Photographic prints in white on a blue background or blue on a white background, respectively, used for copying maps and mechanical/structural design plans. Blueline prints are also used as a proof step in the printing process.

BLUEPRINT PROCESS. The reproduction method used to make blueprints, using paper sensitized with potassium ferricyanide and a ferric salt.

BREAKDOWN CODE. A numerical code assigned to components of an end item on the Task Identification Matrix. (N)

BREAKOUT CONFERENCE. The collective representation of the executive and participating services at a conference called by the executive service for the purpose of reviewing the designated contractor-furnished items for possible conversion to Government-procured and/or -furnished equipment.

BROWNPRINTS, BROWNLINE PRINTS. Photographic prints in white on a dark brown background or brown on a white background, respectively, and made on sensitized paper.

BROWNPRINT PROCESS. Reproduction method using light-sensitive iron and silver salts to produce a negative sepia image from a positive master. Prints are developed by a wet process.

BUFFER STOCK. A quantity of a specific item identified in the phased provisioning schedule that the contractor is authorized to manufacture in advance of normal production requirements.

C

CALIBRATE. To determine and make required corrections in instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the other instrument or test equipment being compared with the certified standard.

CALIBRATION MEASUREMENT REQUIREMENTS SUMMARY (CMRS). A contractor-prepared summary of the technical requirements of a system, sub-system, or equipment outlining the measurement parameters and specifying ranges, accuracies, and calibration intervals for each echelon of measurement. These data are used to determine whether the system, subsystem, or equipment is adequately supported with support equipment (SE), thereby showing traceability to known standards, as well as the measurement, qualification, and calibration workload agreements.

CANCELLATION ADDENDUM/LIST. A list of those items and quantities of spares/repair parts released within the contract provisions and subsequently canceled and for which the contractor claims cancellation charges.

CAPABILITY. The ability of an item to achieve mission objectives, given the item conditions during the mission. (AF)

CASCADING FAILURE. A failure which, if not repaired, will result in additional failure mode(s). (AF)

CATEGORY. A family group of TOs such as Aircraft, Engine, or Test Equipment TOs. See TO 00-5-1 for a list of categories. (●AF)

CAUTION. An insertion in the text of a TO when an operating procedure, practice, and so forth, if not strictly observed, could result in damage to, or destruction of, equipment. (●AF) (See also, WARNINGS, CAUTIONS, AND NOTES.)

CENTRAL TECHNICAL ORDER CONTROL UNIT (CTOCU). A Technical Order (TO) control agency whose responsibility is to direct, manage, and control a complete TO quality assurance program including validation and verification. This unit is normally composed of representation from AFSC, AFLC, using command(s), and contractors. Its location and chairmanship shall be designated by Air Force Systems Command. (●AF)

CHANGE. Any alteration or modification to a prescribed technical order. Also, a document and/or publication issued by the final approving authority to correct or revise the content of a technical order. The word "change" must appear on the document cover sheet. (●AF)

CHUNKING. The placing of data into "chunks" by means of paragraph headings, length of paragraphs, and length of sentences. (N)

CODE IDENTIFICATION NUMBER. A five-digit number listed in Cataloging Handbook H4-1, Federal Supply Code for Manufacturers, which is assigned to activities that manufacture or develop items for the Federal Government. When used with an ECP number, the code identification (manufacturer's code) designates the contractor or Government agency from whose series the ECP number is assigned. When used with a drawing number or part number, the code identification number designates the design activity from whose series the drawing or part number is assigned.

COGNIZANT TRANSPORTATION OFFICE (CTO). The transportation officer or office of the field activity administering the contract for the executive service.

COMMERCIAL PUBLICATIONS. Commercial publications contain technical information about equipment assembly, installation, operation, servicing, disassembly, overhaul, reassembly, and parts identification. These publications are manuals, booklets, pamphlets, or like data, and are normally furnished by manufacturers to purchasers of their products. (●AF; M)

COMMON SUPPORT EQUIPMENT (CSE). A type of support equipment (SE) comprised of only those general purpose items supplying or measuring broad parameters of physical properties such as electrical, pneumatic, and hydraulic power units; towing, hoisting, and fueling devices; signal generation devices; voltage, amperage, and phase measuring devices, etc. that are known to be established in the using service's inventory. The application of SE items to other end articles, systems, or components does not in itself categorize the item as common SE.

COMPLEXITY. The level of difficulty of the presentation of material. The three components of complexity are chunking, proceduralization, and consistency. (N)

COMPONENT. An assemblage or any combination of parts, sub-assemblies, and assemblies mounted together, normally capable of independent operation in a variety of situations. Examples are: Receiver or Transmitter of an ARC-34 VHF Subsystem; relay of a DC or AC power supply Subsystem, Helicopter Gear Box. (AF)

COMPREHENSIBILITY. The measure of the degree to which a manual causes performance consistent with its intent. (N)

CONCEPTUAL PHASE. The initial period when the technical, military, and economic bases for acquisition programs are established through comprehensive studies and experimental hardware development and evaluation. The outputs are alternative concepts and their characteristics (estimated operational, schedule, procurement, costs, and support parameters) which serve as inputs to the Development Concept Paper (DCP) on major systems, and Program Memoranda (PM) on smaller systems/equipments.

CONFIGURATION. The functional and/or physical characteristics of hardware/software as set forth in technical documentation and achieved in a product.

CONFIGURATION CHANGE. Alteration of the form, fit, or function of configuration item (CI), which changes its physical or functional characteristics. (•AF) A proposed or approved technical change to a specified system/equipment under configuration management discipline. (M)

CONFIGURATION CONTROL. The systematic evaluation, coordination, approval or disapproval, and implementation of all approved changes in the configuration of a CI after formal establishment of its configuration identification.

CONFIGURATION CONTROL BOARD (CCB). A board comprised of representatives of the executive and participating service(s) established to control changes proposed by the Government or by the contractor that affect the configuration, funds, or modification, or result in new procurement.

CONFIGURATION IDENTIFICATION. The current approved or conditionally approved technical documentation for a configuration item (CI) as set forth in specifications, drawings, and associated lists, and documents referenced therein.

CONFIGURATION ITEM (CI). The primary level of assembly for management control, accountability, spares provisioning, and technical publications/data preparation. It is the level for which a top assembly drawing will be prepared. It is also the assembly level at which the configuration control board (CCB) will maintain configuration control. CIs may vary widely in complexity, size, and type, from an aircraft, electronic, or ship system to a test meter or round of ammunition. During development and initial production, CIs are only those specification items that are referenced directly in a contract (or an equivalent in-house agreement). During the operation and maintenance period, any reparable item designated for separate procurement is a configuration item.

CONFIGURATION MANAGED EQUIPMENT. Equipment that reflects the current configuration of vehicles and/or systems currently in the Air Force operational inventory. This equipment requires the use of the latest TO information as listed in the Numerical Index and Requirement Table (NI&RT). (●AF)

CONFIGURATION MANAGEMENT. A discipline applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status.

CONFIGURATION STATUS ACCOUNTING. The recording and reporting of the information that is needed to manage configuration effectively, including a listing of the approved configuration identification, the status of proposed changes to configuration, and the implementation status of approved changes.

CONSISTENCY. The repeated use of the same word, operation mode, procedure, abbreviation, nomenclature, capitalization, etc., so that comprehensibility is enhanced. (N)

CONSOLIDATED SUPPORT EQUIPMENT LIST (CSEL). Reflects a summary of Government decisions on contractor's support equipment (SE) recommendations and other pertinent data relative to support of the end article. The list is a compilation of selected data contained in individual sections of the support equipment recommendation data (SERD). The lists are used by Government agencies for reflecting SE unit allowance authorization requirements and status of certain logistics elements.

CONSUMABLE ITEM. Any item or substance which, upon installation, loses its identity and is normally consumed in use or cannot be economically repaired.

CONTINGENCY RETENTION STOCK. That portion of the quantity of an item in excess of the approved force retention level for which there is no predictable demand or quantifiable requirement, and which would normally be allocated as potential DOD excess stock, except for a determination that the quantity will be retained for possible contingencies for United States Forces. (Category C ships, aircraft, and other items being retained as contingency reserve are included in this stratum.)

CONTRACT DATA REQUIREMENTS LIST (CDRL). A form (DD FORM 1423) used as the sole list of data and information which the contractor will be obligated to deliver under the contract, with the exception of those data specifically required by standard Defense Acquisition Regulation (DAR) clauses.

CONTRACT FIELD SERVICES (CFS). Those engineering and technical services provided to DOD personnel by commercial or industrial companies on-site at defense locations by trained and qualified engineers and technicians.

CONTRACT MAINTENANCE. Any maintenance accomplished by private industry in Government-owned, contractor-operated or contractor-owned, contractor-operated plants by contract field teams.

CONTRACTOR DATA. Data relating to equipment designed specifically for the Air Force. The data differ from commercial-type data in that equipment and data are neither available nor used on the commercial market. Contractor data usually consist of documents, pamphlets, or instructions, and contain technical information. These data may consist of, but are not limited to, specifications, schematics, wiring diagrams, drawings, checklists, and other data. (●AF)

CONTRACTOR ENGINEERING AND TECHNICAL SERVICES (CETS). Those services performed by commercial or industrial companies which provide advice, instruction, and training to personnel of the military departments in the installation, operation, and maintenance of DOD systems and equipment. These services include transmitting the knowledge necessary to develop the technical skill required for installing, maintaining, and operating such equipment in a high state of military readiness.

CONTRACTOR FURNISHED EQUIPMENT (CFE). An item manufactured or purchased by the contractor for inclusion in, or support of, the system/equipment.

CONTRACTOR PLANT SERVICES (CPS). Those services provided to personnel of the military departments in the plants and facilities of the manufacturer of military equipment or components by trained and qualified engineers and technicians employed by the manufacturer.

CONTRACTOR VALIDATION. The process by which contractor personnel test the technical data package – for example, manuals, drawings, and prints – for technical accuracy and adequacy. The term is sometimes used synonymously with the term "contractor technical manual validation."

CORRECTIVE MAINTENANCE. The actions performed, as a result of failure, to restore an item to a specified condition.

COSTS (NON-RECURRING). One-time costs that will be incurred if an engineering change is ordered and which are independent of the quantity of items changed, such as cost of redesign, special tooling, or qualification.

COSTS (RECURRING). Costs that are incurred for each item changed or for each service or document ordered.

CRITICAL ITEM. An essential item that is in short supply or is expected to be in short supply for an extended period. An item within a configuration item (CI) which, because of special engineering or logistics considerations, requires an approved specification to establish technical or inventory control at the component level.

D

DATA. The means for communicating concepts, plans, descriptions, requirements, and instructions relating to technical projects, materiel, systems, and services. These may include specifications, standards, engineering drawings, associated lists, manuals, and reports, including scientific and technical reports; they may be in the form of documents, displays, sound records, punched cards, and digital or analog data.

DATA ACCUMULATION WORKSHEET (DAW). A worksheet or list prepared by the executive and participating services during or after assignment of source, maintenance, and recoverability (SMR) codes for recording essential elements of data for (but not limited to) cataloging, requirements computation, inventory management, and allocations for initial outfitting. The elements of data will be entered on the worksheet in the terms directed by the executive and participating services' separate management and data systems.

DATA CALL. The formal procedure used by the data management officer (DMO) to acquire data requirements for any given program/project from appropriate participating Government activities.

DATA ITEM DESCRIPTION (DID). A form (DD FORM 1664) that specifies the data required to be furnished by a contractor. The forms specifically define, using the descriptive method, the content, preparation instructions, format, and intended use of each data product.

DATA MANAGEMENT. The process of determining and validating each data requirement and of planning for the timely and economical acquisition of data.

DATA MANAGEMENT OFFICER (DMO). The individual designated to manage the acquisition of data for a system/project.

DEFICIENCIES. Deficiencies are of two types:

(1) Conditions or characteristics in any hardware/software which are not in compliance with specified configuration.

(2) Inadequate (or erroneous) configuration identification which has resulted, or may result, in configuration items that do not fulfill approved operational requirements.

DEFINED MAINTENANCE CONCEPT. The planned or envisioned methods that will be employed to sustain an end item at a defined level of readiness or in a specific condition. (N)

DELIVERABLE ITEM. An item identified in a contract that will be delivered by the preparing activity.

DEPENDABILITY. The probability that an item will enter or occupy each one of its operational modes during a specified mission and will perform the functions associated with those operational modes successfully. (AF)

DEPLOYMENT PHASE. The period beginning with the user's acceptance of the first operational unit and extending until the system is phased out of the inventory. It overlaps the production phase.

DEPOT LEVEL MAINTENANCE. That category of maintenance actions normally including: inspection, test, repair, modification, alteration, modernization, conversion, overhaul, reclamation, or rebuild of parts, assemblies, sub-assemblies, components, equipment end items, and weapons systems; the manufacture of critical non-available parts; and providing technical assistance to maintenance activities. Depot level maintenance is the responsibility of, and is performed by, designated maintenance activities, to augment stocks of serviceable material and to support

organizational and intermediate maintenance activities by more extensive shop facilities and equipment and personnel of higher technical skill than are normally available at the lower levels of maintenance. Depot level maintenance is normally accomplished in fixed shops or by dispatched teams. (AF)

DEPOT LEVEL MAINTENANCE SUPPORT. Maintenance and modification support accomplished or provided by Air Force Logistics Command (AFLC). It includes organizational and intermediate level maintenance or modification work that cannot be economically accomplished within the using command's total resources and is so certified by the using command headquarters. Also included is depot level maintenance or modification work which, due to the complexity of the job, requires special skills, tools, equipment, or facilities available only at a depot level facility. (AF)

DEPOT MAINTENANCE INTERSERVICE SUPPORT AGREEMENT (DMISA). An agreement whereby one service (the agent) accomplishes depot level maintenance work for another service (the principal).

DEPOT MAINTENANCE REPAIRABLE ITEM (DMRI). A recoverable item that is SMR coded to require repair in more extensive facilities than are available at the field level.

DEPOT MAINTENANCE SUPPORT ASSIGNMENT. The DOD component designated by the Secretary of Defense to provide depot maintenance support to all users of specified multiservice equipment.

DESCRIPTIVE DATA. Nonprocedural data, such as Principles of Operation and Illustrated Parts Breakdowns. (N)

DESCRIPTIVE METHOD IDENTIFICATION (DMI). A listing of the physical and operating characteristics that make an item unique from similar items for the purpose of obtaining national stock number (NSN) assignment for items being procured which have not been cataloged.

DESIGN CHANGE NOTICE (DCN). A formal notification prepared by a contractor as a result of an approved engineering change to the end article on the contract. It describes the effect of the change on repair parts which have been procured, recommended, and/or interim-released.

DESIGN CONSTRAINT. A detailed design requirement which identifies limits within which the configuration item (CI) must be designed to perform its functional requirements.

DESIGN REQUIREMENT. A statement of the essential characteristics of an element.

DESIGN REVIEWS. Design reviews are defined in MIL-STD-1521. Design reviews are held to formalize system requirements, preliminary design, and detailed designs. The design reviews are system design review (SDR), preliminary design review (PDR), and critical design review (CDR).

DESIGN TO COST (DTC). See Life Cycle Cost (LCC).

DESIGNATED OVERHAUL POINT (DOP). A depot level rework facility assigned the technical and rework responsibility for a given system, subsystem, or component.

DETAIL SPECIFICATION. A document which covers (either within itself or by referring and supplementing a general specification) the complete requirements for only one type of item, or for a limited number of types, classes, etc. of similar characteristics.

DETAILED DESIGN. An effort expended to translate the functional requirements (specified in configuration item (CI) specifications, facility design criteria, or procedural documents and in personnel and logistics data), into detailed drawings and/or data required to fabricate or procure system elements.

DETAILED DESIGN REQUIREMENTS. A design requirement which satisfies the following: a. prevents incorporation of undesirable characteristics; b. establishes parametric, quantitative boundary values within which element characteristics must fall; c. provides explanation of qualitative criterion in terms of unique application to elements; d. translates qualitative criterion into quantitative values unique for elements; e. provides reasonable assurance that design solutions will be acceptable; f. permits quantitative evaluation of element characteristics at technical reviews, audits, etc; g. applies to only one element.

DEVELOPMENT PROGRAM MANUAL (DPM). Organized groupings of procedural support data by system, subsystem, or end item. DPMs are used by contractors, Air Training Command, or Air Force test personnel during such programs as research and development prototype evaluation and full-scale development programs. DPMs provide information on assembly, installation, operation and maintenance, and procedures for explosive ordnance disposal and rendering the ordnance safe. (●AF)

DEVELOPMENT SPECIFICATION. A document applicable to an item below the system level which states performance, interface, and other technical requirements in sufficient detail to permit design, engineering or service use, and evaluation.

DEVELOPMENTAL SUPPORT EQUIPMENT (DSE). An item of SE for which no Government-approved specification/drawing exists. This includes: SE items to be designed and developed; privately developed or commercial items being introduced.

DEVIATION. A specific written authorization, granted prior to the manufacture of an item, to depart from a particular performance or design requirement of a specification, drawing, or other document.

DIAZO PRINTS. Direct-positive prints produced from translucent or transparent originals by contact printing and ammonia-vapor or moist development.

DIAZOTYPE PROCESS. Reproduction method based on light-sensitive diazo compounds in which a colored, positive azo dye image is formed from a positive master.

DIRECT MAINTENANCE SUPPORT. Refers to that maintenance performed on materiel while it remains under the custody of the using command. Upon restoration of serviceable condition, the material normally is returned directly to service.

DIRECTED REMOVAL. A requirement to remove an item after a fixed period of operation because there is insufficient confidence in its continued satisfactory operation and because failure during operation could have serious consequences.

DOCUMENTATION ANALYSIS. The process of determining the state of development of the end item and identifying available documentation: the first step in task development. (N)

E

ELECTROSTATIC PRINTS. Products of a process in which a residual electrostatic charge after light exposure is used to produce an image.

ELECTROSTATIC PROCESS. Reproduction method in which image formation depends on electrical, rather than chemical, changes induced by light.

ELEMENT. Any discrete component of one of the following parts of the weapon system: (a) aerospace vehicle equipment (AVE); (b) support equipment (SE); (c) facilities, including reserve personnel (RP) and real property installed equipment (RPIE); (d) operations and maintenance personnel; (e) operational and maintenance technical publications/data; (f) supplies and spares. (AF)

END ARTICLE (EA). An end product weapon, aircraft system, subsystem, component, or equipment for example, transmission, engine, computer, radio, etc. - in the inventory or being procured on the contract, including contractor-furnished materiel.

END ITEM. A final combination of end products, component parts, and/or materials which is ready for its intended use; e.g., ship, tank, mobile machine shop, aircraft.

END ITEM AND SUPPORT EQUIPMENT PUBLICATIONS. Those official publications, identified by a Government publication number, which pertain to the maintenance and operation of the related end item, Government installed and Government furnished operational equipment and the related tools, support, and test equipment applicable thereto.

END ITEM SPECIFICATION (EIS). Contractor specification describing performance and design criteria of the system/equipment or supporting elements therefor.

ENGINEERING CHANGE. An alteration in the configuration of a configuration item or items, delivered, to be delivered, or under development, after formal establishment of its configuration identification.

ENGINEERING CHANGE JUSTIFICATION CODE. A code which indicates the reason for a Class I engineering change.

ENGINEERING CHANGE PRIORITIES. The rank assigned to a Class I engineering change, which determines the methods and resources to be used in review, approval, and implementation.

ENGINEERING CHANGE PROPOSAL (ECP). A term which includes both a proposed engineering change and the documentation by which the change is described and suggested.

ENGINEERING COGNIZANCE. The assigned responsibility and delegated authority to issue, maintain, and change a specification, standard, or technical document.

ENGINEERING DEVELOPMENT. Includes those development programs being engineered for service use but which have not yet been approved for procurement or operation.

ENGINEERING MANAGEMENT. The management of the engineering and technical effort required to transform a military requirement into an operational system. It includes the system engineering required to define the system performance parameters and preferred system configuration to satisfy the requirement, the planning and control of technical program tasks, integration of the engineering specialties, and the management of a totally integrated effort of design engineering, specialty engineering, test engineering, logistics engineering, and production engineering to meet cost, technical performance, and schedule objectives.

ENGINEERING SPECIALTY INTEGRATION. The timely and appropriate intermeshing of engineering efforts and disciplines such as reliability, maintainability, logistics engineering, human factors, safety, value engineering, standardization, transportability, etc., to insure their influence on system design.

EQUIPMENT END ITEM. An instrument of combat or combat support employed in the accomplishment of military missions. It consists of a final combination of assemblies, parts, and materials which together perform a complete operational function, that is ready for its intended use, such as missile, aircraft, ground radar site, communication system. (AF)

EQUIPMENT MAINTENANCE. The sustaining of materiel in an operational status, restoring it to a serviceable condition, or updating and upgrading its functional utility by modification.

EQUIPMENT MAINTENANCE MANAGEMENT. The management of the Air Force equipment maintenance program. It is made up of two supporting functions: maintenance engineering management and maintenance production management. It is the process of developing workload requirements, forecast, and planning, organizing, staffing, directing, and controlling the production, engineering, industrial, and other resources necessary to effectively and economically support Air Force equipment operational objectives. (AF)

EQUIPMENT PERFORMANCE DATA. Historical information relating to maintainability, reliability, and supportability characteristics of systems, subsystems, and components of weapons and end item equipments during their life cycle. (AF)

ESSENTIAL ITEM. A support item or a repair part, the lack of which renders the support system or end item inoperable.

EXCESS STOCK. The quantity of an item in a military service which exceeds the service's retention limit for the item and is subject to utilization screening, reclamation, demilitarization, or any other appropriate disposal action.

EXECUTIVE SERVICE. That DOD service which is formally designated, assigned responsibility, and delegated authority for life cycle management for a multiservice system/equipment jointly used by two or more services.

EXPLODED VIEW. An isometric view of hardware or equipment that is shown disassembled, such that the interconnecting parts are in the same order as when fully assembled. Axis lines are used to indicate the interconnection of the parts.

F

FACILITY. The term embraces:

1. A physical plant, such as real estate and improvements thereto, including buildings and equipment, which provides the means for assisting or making easier the performance of a function; for example, base, arsenal, or factory.
2. Any part or adjunct of a physical plant, or any item of equipment which is an operating entity and which contributes or can contribute to the execution of a function by providing some specific type of physical assistance.

   Note: For SISMS (Standard Integrated Support Management System) purposes, contractor-operated industrial facilities (Government-owned or contractor-owned) where the system/equipment is developed and manufactured are specifically excluded from consideration.

FACILITIES DESIGN CONCEPTS. Conceptual studies designed to demonstrate the most effective way of modifying standard using service facilities to meet the needs of the system/equipment item or to suggest optimal approaches to the design of new, unique facilities.

FACILITIES DESIGN CRITERIA. A narrative definition of the facility design requirements necessary to satisfy specific functional requirements. The design criteria are in terms such as axle loads; hoist requirements; and special handling, installation, storage, electrical, environmental, or service requirements.

FACILITIES ENGINEERING INFORMATION. The technical data required by using service facilities engineering offices to evaluate their existing facilities for adequacy to support the new system/equipment, and to accomplish construction/modification projects to overcome facilities deficiencies. This information is an output of the engineering effort required to formulate the Integrated Logistics Support (ILS) plan and consists of a requirements plan, design criteria, and design concepts.

FACILITIES REQUIREMENTS (BASING COMPLEXITY AND DEPLOYMENT MODES). The term "basing complexity and deployment modes" is used in connection with facilities requirements to denote that while the basic complement may be a unit of a certain size—for example, a wing of aircraft—it may be known that other size units will/can exist (for example, six aircraft, a squadron, etc.) and in this case, facilities requirements are needed for each size unit that can exist separately at one geographic location. These requirements identify specific real property/utility requirements needed to satisfy a particular system/equipment functional task (size engine, shop required, type of power required, etc.)

FACILITIES REQUIREMENTS PLAN. Quantitative baseline document that describes the total facilities needed to support a new system/equipment item at test, training, operational, and logistics support bases. It is used by using service facilities planners to evaluate existing facilities, determine deficiencies, and initiate programming actions to overcome those deficiencies.

FAILURE. The termination of the ability of an item to perform its required function.

FAILURE RATE. The number of failures of an item per unit measure of life (cycle, time, miles, events, etc., as applicable for the item).

FAULT. Any defect in or impairment of item performance. (AF)

FIELD SERVICE REPRESENTATIVE (FSR). An employee of a manufacturer of military equipment or components who provides a liaison or advisory service between a company and military users of the company's equipment or components.

FLESCH READING EASE SCORE. A measure of reading level that involves the number of sentences, the number of words, the length of sentences, and the number of syllables.

FLIGHT TECHNICAL ORDER REVIEW BOARD (FTORB). An Air Force board that is chaired jointly by the Verification Team Manager (VTM) and the Flight Manual Control Officer (FMCO) and consists of, as a minimum, three pilot members designated in writing, or alternates of the same qualifications designated in writing, identified prior to convening the board. Additional non-voting personnel may participate as required to provide engineering expertise. (●AF)

FOG INDEX. A measure of reading level that involves the length of sentences, the number of words, and the percentage of difficult words. (N)

FOLLOW-ON PROVISIONING. See Initial Provisioning.

FOLLOW-ON TASKS. An associated task that must be done because another task is being performed. An example of a follow-on task might be the conduct of a minimum performance test because a component was replaced. (N)

FORECASTING ACTIVITY. An activity with particular knowledge and a capability to identify materiel requirements in support of special programs. forecasting activity may be a central point within a complex of requiring activities.

FORM, FIT AND FUNCTION. That configuration comprising the physical and functional characteristics of the item as an entity but not including any characteristics of the elements making up the item.

FORMAL TECHNICAL ORDERS (FTO). Military specification TOs that have been sufficiently verified to make them usable for operation and maintenance, and which are printed and available for distribution in the TO System. They may be fully verified, or when used under the two-step verification concept, they may be partially verified with only the safety and essential verifications accomplished. Until they are fully verified, they must contain a verification status page, identifying those functions that have not been verified. (●AF)

FORMAT. Generally, the organization, arrangement, and level of specificity of the informational content of operations and maintenance instructions. Specifically, formats are the basic structures that characterize a particular technique. They result from particular combinations of a limited number of Format Elements into Format Components, then into Subordinate Formats or directly into Formats. A Format presentation must be sufficiently comprehensive to initiate *and* complete a task.

Format Components. Combinations of Format Elements that are insufficiently complete to be called a Subordinate Format or Format.

Format Element. The basic building blocks of data presentation; e.g., words, photographs, numbers, symbols.

FORMAT REQUIREMENTS. Configuration and text layout of technical orders (TOs) as prescribed in TO military specifications. (●AL: M)

FULL SCALE DEVELOPMENT PHASE. The period when the system equipment and principal items necessary for its support are designed, fabricated, tested, and evaluated. The intended output is, as a minimum, a pre-production system which closely approximates the final product, the documentation necessary to enter the production phase, and the test results which demonstrate that the production product will meet stated requirements.

FUNCTION. That action which must be performed by an element or elements of the system in order for the system to accomplish its intended purpose.

FUNCTIONAL AREA. A distinct group of system performance requirements which, together with all other such groupings, forms the next lower level breakdown of the system on the basis of function.

FUNCTIONAL CHARACTERISTICS. Quantitative performance, operating, and logistics parameters and their respective tolerances. Functional characteristics include all performance parameters, such as range, speed, lethality, reliability, maintainability, safety.

FUNCTIONAL CONFIGURATION AUDIT. The formal examination of functional characteristics' test data for a configuration item, prior to acceptance, to verify that the item has achieved the performance specified in its functional or allocated configuration identification.

FUNCTIONAL CONFIGURATION IDENTIFICATION (FCI). The current approved technical documentation for a configuration item (CI) which prescribes all necessary functional characteristics; the tests required to demonstrate achievement of specified functional characteristics; the necessary interface characteristics with associated CIs, the CI's key functional characteristics and its key lower level CIs, if any, and design constraints, such as envelope dimensions, component standardization, use of inventory items, ILS (integrated logistics support) policies.

FUNCTIONAL GROUP CODE (FGC). A standard indexing system establishing a systematic breakdown of the end item or article into its functional groups, basic systems, installation, assemblies, or components.

FUNCTIONAL REQUIREMENT. A detailed design requirement which specifies a function of an element.

FUNCTIONAL TASK. A single maintenance function performance on an item of hardware, such as removal, installation, assembly, disassembly, testing, troubleshooting, repair, etc. The functional task is the cornerstone of the work package concept. (N)

G

GENERAL SPECIFICATIONS. A document which covers the requirements common to different types, classes, grades, and or styles of items or services.

GOVERNMENT FURNISHED EQUIPMENT (GFE) GOVERNMENT FURNISHED PROPERTY (GFP). Property in the possession of, or acquired directly by, the Government and subsequently delivered or otherwise made available to the contractor.

GFE COORDINATION OFFICE. The organization in the executive and participating service(s) responsible for coordinating, collecting, and controlling the planning, acquisition, allocating, and delivery of GFE for a system equipment program. This office is responsive to the Program Manager System Program Management Office (PM SPMO) for each system equipment program.

GFE MANAGER. The designated individual or office assigned by the executive service program manager who is responsible for the GFE program and provides a central point of contact for all GFE as related to the system equipment program.

GOVERNMENT FURNISHED MATERIAL (GFM). Material provided by the Government to a contractor or comparable Government production facility to be incorporated in, attached to, or used with or in support of an end item to be delivered to the Government or ordering activity, or which may be consumed or expended in the performance of a contract. It includes, but is not limited to, raw and processed materials, parts, components, assemblies, and small tools and supplies. Material categorized as Government Furnished Equipment (GFE) and Government Furnished Aeronautical Equipment (GFAE) is included.

GOVERNMENT VERIFICATION. The process by which contractual requirements and technical characteristics, documentation, and manuals are tested and proved (by the military service(s) under executive service jurisdiction) to be adequate and accurate for operation and maintenance of equipment and for certifying that selected technical requirements, documents, and manuals are compatible with the hardware. Verification entails the actual performance by Government personnel of the operating and maintenance procedures, including checkout, calibration, alignment, scheduled removal and replacement instructions, and associated checklists.

GROUP ASSEMBLY PARTS LIST (GAPL). The portion of an Illustrated Parts Breakdown (IPB) containing a breakdown of all systems, assemblies, and subassemblies which can be disassembled, reassembled, or replaced and are contained in the end item. The GAPL usually comprises illustrations, index numbers, parts numbers, descriptions, and Usable On Codes. (N) In the Air Force, this is now termed a Maintenance Parts List (MPL).

GUIDANCE MEETING. A meeting which includes a group of Government personnel, the contractor, and applicable vendors assembled at the earliest practical date after award of a contract to establish and/or confirm provisioning policy and technical guidance to be followed in support of the end article(s) under contract.

H

HALFTONE. A photograph reproduced for printing by a "screening" process.

HARDWARE. The generic term dealing with physical items of equipment, tools, implements, instruments, devices, sets, fittings, trimmings, assemblies, subassemblies, components, parts, raw materiel, etc., as opposed to specifications, drawings, funds, personnel, or services.

HEALTH HAZARDS PRECAUTION DATA. Precautionary statements placed in TOs when hazardous chemicals or adverse health factors in the environment or use of the equipment cannot be eliminated. (●AF)

I

ILLUSTRATED PARTS BREAKDOWN (IPB). A manual containing illustrations and part numbers for all parts of the applicable hardware. The IPB contains information needed for ordering parts and identifying parts and arrangements of parts in SM&R codes, and Usable-On codes.

IMAGE AREA. The area on a page that is reserved for the textual material and illustrations. For the size of this area, refer to the applicable specification.

INDENTURE NUMBER. The indenture number is the group assembly breakdown order, starting with indenture zero, identifying the equipment group; indenture 1, the configuration item identifier; and progressing in order through 2, 3, 4, etc., in accordance with the mechanical disassembly relationship (e.g., 2 is a subassembly of 1, 3 is a subassembly of 2, etc.)

INDEX TECHNICAL ORDER. A type of TO which shows the status of all TOs, and provides personnel with a means of selecting needed publications and, in instances, group publications pertaining to specific items of equipment. Examples are "Numerical Index and Requirement Table (NI&RT)," and "Lists of Applicable Publications (LOAPs)." (●AF)

INDIRECT MAINTENANCE SUPPORT. Refers to that maintenance performed to material (usually) after its withdrawal from the custody of the using organization or command. Upon restoration to serviceable condition, the material is returned to stock for reissue or, where authorized, returned directly to the user.

INDUSTRIAL PROPERTY ACCOUNT (IPA). The contractor's account assigned for the purpose of accounting for parts and material required for maintenance, repair, and overhaul of the system in accordance with Appendix B of the Defense Acquisition Regulation (DAR).

INDUSTRY STANDARD ITEMS. An item approved for general commercial usage and for which dimensional and quality requirements are contained in an industrial standard (document) developed and promulgated by a technical society, trade association, or federation thereof; for example, SAE, NAS, ASA, etc.

INITIAL DISTRIBUTION (ID). A system of providing TOs to TODOs as soon as possible after printing is completed. (●AF)

INITIAL OPERATIONAL SUPPORT DATE (IOSD). The date on which the executive/participating service(s) logistics support system assumes total support responsibility for an item or equipment. Preoperational support, if applicable to a hardware or system acquisition, terminates at this date.

INITIAL PROVISIONING. The process of determining the range and quantity of items, for example, spares and repair parts, special tools, test equipment, and support equipment (SE), required to support and maintain an end item of material for an initial period of service. Its phases include the identification of items of supply; the establishment of data for catalog, technical manuals, and allowance list preparation; and the preparation of instructions to assure delivery of necessary support items with related end articles. Follow-on provisioning (a subsequent provisioning of the same equipment from the same contractor) and reprovisioning (a subsequent provisioning of the same equipment from a different contractor) are refinements of initial provisioning, and are distinct from replenishment or reprocurement actions.

INITIAL ORDER. An order for a specified quantity of bread-board, prototype, or production-type support equipment (SE) required for development, test, or evaluation; or for the support of the end article program.

INITIAL TECHNICAL ORDER (TO) KIT. A package of TOs and Forms furnished to new TODOs. It contains copies of TODO Technical Order Publication Requirement Table (AFTO Form 187); a copy of TO 00-5-1, -2, and -15; and two copies of Numerical Index and Requirement Table (NI&RT), TO 0-1-01, -02. When requested, other specific NI&RTs are included. (●AF)

INITIATOR. The individual who identifies a discrepancy and/or deficiency in the TO System and prepares the documentation and recommended change for submission to the final approving authority. (●AF)

IN PROCESS REVIEW (IPR). A review of contractual requirements, technical documentation, characteristics, and manuals at any time during the development to provide guidance to the contractor and to assure that the technical requirements, documentation, and manuals are being written in accordance with the applicable specifications.

INSPECT AND REPAIR (I&R). The rework/depot level work package for total systems/equipments components. (A)

INSTALLATION LEADTIME (ILT). The time required for delivery of Government-furnished equipment to the prime contractor for installation in the system/equipment.

INTEGRATED LOADING MANUALS AND CHECKLISTS. Manuals and checklists covering munition-loading configurations consisting of two or more different types, without regard to whether the munitions are nuclear or nonnuclear. (●AF)

INTEGRATED LOGISTICS SUPPORT (ILS). A composite of all the support considerations necessary to assure the effective and economical support of a system for its life cycle. It is an integral part of all other aspects of system acquisition and operation. ILS is characterized by harmony and coherence among all the logistics elements. The principal elements of ILS related to the overall system life cycle include: the maintenance plan, support and test equipment, supply support, transportation and handling, technical data, facilities, personnel and training, logistics support resource funds, and logistics support management information. It supports the optimization of tradeoffs between design and support requirements for the total life cycle to achieve the lowest practical cost of ownership.

INTEGRATED LOGISTIC SUPPORT PLAN (ILSP). The Government's detailed ILS management plan, prepared by the contractor for a specific acquisition program. It provides a comprehensive plan for implementing the logistic concepts, techniques, and policies necessary to assure the effective economical support of a system/equipment during its life cycle. It is a dynamic document which continually grows with the increased availability of information and provides for integration of logistics elements into program planning, development, test and evaluation, production, and operational processes.

INTERCHANGEABLE ITEMS. Two or more items which possess such functional and physical characteristics as to be equivalent in performance and durability and capable of being exchanged one for the other without alteration of the items themselves or of adjoining items except for adjustment.

INTERIM RELEASE. The authorization given to a contractor to release to production or procurement certain end article support items prior to submission of a parts order by the Government.

INTERMEDIATE LEVEL MAINTENANCE. The level of maintenance that has the responsibility for, and is performed by, designated maintenance activities for direct support of the organizational level. (N)

INTERMEDIATE LEVEL MAINTENANCE. That category of maintenance actions which is normally the responsibility of and performed by designated maintenance activities for direct support of the using organization. Normally it is accomplished in fixed or mobile shops or by mobile teams and includes: (a) Inspections of materiel other than aircraft, missiles, or communications-electronics meteorological (CEM) end items; (b) repair of unserviceable parts, assemblies, subassemblies, and components; (c) modification of materiel as directed; (d) repair and testing of gas turbine engines and reciprocating engines; (e) local manufacture of critical nonavailable parts, as authorized; (f) test and calibration; (g) demilitarization and reclamation of materiel; (h) corrosion prevention and control; (i) scheduled inspection and on-equipment repair of aircraft, missiles, engines, CEM, and aerospace ground equipment (AGE) when greater efficiency can be attained than at the organizational level. (AF)

INTERSERVICE DEPOT MAINTENANCE INTERROGATION SYSTEM (IDMIS). An automated program established for preparing a periodic directory (in list form) of depot level repair items in all the services, identified to the specific national stock number (NSN) items repaired.

INTERSERVICE LIAISON OFFICER (ILO). An individual service representative located at a sister service maintenance interservice support management office (MISMO) to provide liaison/co-ordination between that service and other services or Government agencies on interservice matters. Acts as on-site assistant to the service's MISMO.

INTERSERVICE MAINTENANCE SUPPORT. Maintenance, either recurring or non-recurring, performed by the organic capability of one military service or element thereof in support of another military service or element thereof.

INTERSERVICE SUPPORT. Action by one military service or element thereof to provide logistical and/or administrative support to another military service or element thereof. Such action can be recurring or non-recurring in character, on an installation, area, or worldwide basis.

INTERSERVICE TECHNICAL INFORMATION EXCHANGE SYSTEM (ITIES). A formalized method of exchanging technical data and information on common-use equipment between DOD components.

INSURANCE ITEM. An item for which there is occasional unpredictable demand, not sufficiently repetitive to warrant classification as a regular stock item, but of which prudence requires that nominal quantity be stocked. The essentiality of the item and the leadtime required to obtain it by purchase would create an unacceptable situation if stock were not readily available.

INVENTORY CONTROL POINT (ICP). An organizational unit or activity within a DOD supply system which is assigned the primary responsibility for the materiel management of a group of items either for a particular service or for the Defense Department as a whole. Materiel inventory management includes cataloging direction, requirements computation, procurement direction, distribution management, disposal direction, and, generally, rebuild direction.

ITEM. A generic term to denote a system, segment of a system, subsystem, personnel subsystem, software, equipment, component, part, etc. (AF)

ITEM MANAGER (IM). See System Manager (SM).

J

JOB PERFORMANCE AID (JPA). Any device, manual, guide, or tool used on-the-job to facilitate performance or to avoid costs, where learning from the aid is incidental.

JOB PERFORMANCE AID (JPA) SYSTEM. Includes one or more Primary Formats and/or any number of Formats, Subordinate Formats, and Format Components and Elements; may also include "standard" data, media, delivery, diagnostic, and training characteristics and components.

JPA Systems encompass a wide range of data applications; for example, operation *and* maintenance, different maintenance levels, or all aspects of maintenance.

JOINT CONFIGURATION CONFERENCE (JCC). The collective representation of the executive and participating service(s) at a conference called by the executive service for the purpose of deciding the Government furnished equipment (GFE) required for installation in the system.

JOINT NUCLEAR WEAPONS PUBLICATIONS (JNWPs). These technical publications, which carry an Air Force Technical Order (TO) 11N, 60N, or 60NR designator and also bear other Service, Defense Nuclear Agency (DNA), or Department of Energy (DOE) designators, are published under the provisions of a Memorandum of Understanding between the DOE and the Department of Defense. JNWPs are designed to preclude the necessity for issuance of separate service, DNA, and DOE manuals on the same subject, relating to nuclear ordnance and ancillary equipment in areas such as operation, maintenance, explosive ordnance disposal (EOD), supply, transportation, safety, and stockpile accounting. (●AF; M)

JOINT OPERATING AGREEMENT (JOA). An agreement between the executive and participating service(s) defining the methods and procedures for support of a multi-service system/equipment.

JOINT OPERATING PROCEDURE (JOP). An instruction which identifies and describes the discrete, detailed procedures and interactions necessary to carry out all aspects of a system/project.

JOINT PLANNING AND SCHEDULING GROUP (JPSG). The JPSG is a joint service group, having a collective responsibility to each service, whose function is investigation and negotiation leading to optimum utilization of organic and contractual resources in the accomplishment of depot level maintenance workloads for repairable items.

JOINT SUPPORT ITEMS (JSI). National Stock Number (NSN) items identified as supply status code 1, used by the agent (the source providing support) and one or more principals (the activity obtaining support from the agent) and peculiar to the designated system in the principal(s) service. Items meeting Defense Supply Agency/General Services Administration (DSA/GSA) item management criteria are excluded. The agent will manage the item throughout its life cycle unless deletion is mutually agreed to by the agent and principal(s) at Headquarters echelons; for example, AMC/NMC/AFLC/AFSC (the Army and Navy Materiel Commands, the Air Force Logistics Command and Systems Command).

JOINT SUPPORT LIST (JSL). A list of multiservice-used items of supply which, by joint agreement, are managed by a single service.

K

KEY FUNCTIONAL CHARACTERISTICS. Those functional characteristics that critically affect the configuration item's satisfactory fulfillment of the operational requirements; for example, a transport aircraft's payload/range characteristics.

L

LEADED. Refers to the space between lines of type. For example, if a line of type is 10 point, and there are 12 points of vertical space, the line is said to be 2-point leaded.

LEADTIME. A composite of production, administrative (both contractor and Government), spares, positioning, and shipping time.

LEGEND. A tabular listing of the key symbols, numbers, letters, and their meanings.

LEVEL OF REPAIR ANALYSIS. A term assigned to a technique which establishes whether an item should be repaired, and at what maintenance level (organizational, intermediate, or depot), or whether it should be discarded. Also known as optimum repair level analysis (ORLA) and, simply, repair level analysis (RLA).

LIFE CYCLE. The total life span of system/equipment commencing with program initiation and extending through the operational phase up to retirement from the inventory.

LIFE CYCLE COST/DESIGN TO COST (LCC/DTC). Life cycle cost is the total cost to the Government of acquiring, operating, and supporting the weapon system. LCC includes research, design, test, evaluation, production and/or procurement, and operating and support costs. DTC is the management concept which is applied to the program wherein rigorous cost goals are established during development. The control of these goals is achieved by practical tradeoffs between performance, cost, and schedule. The analyses have as their goal the delivery, on schedule, of the minimum-cost system that meets the essential requirements.

LINE DRAWING. A drawing of an object, as opposed to a photograph. A line drawing has no shading or halftones.

LINE-OF-REGARD. The view the technician sees when working on the hardware or equipment. (N)

LIST OF FIGURES. If a separate IPB is provided at the intermediate or depot levels, it is called a List of Figures. (N)

LIST OF STANDARD/MODIFIED HAND TOOLS (LSMHT). That information required to facilitate screening and proper logistics action for standard tools. The list allows the using commands to properly plan for the required hand tools.

LOGISTICS ELEMENT. One of the areas of support activity which collectively comprise the management concept of integrated logistics support.

LOGISTICS MANAGER. An individual appointed by the logistics activity of the executive service who is responsible to the system/project manager for the identification, planning, scheduling, pricing, funding, and program management of total ILS requirements for a specified system.

LOGISTICS SUPPORT. The material and services required to enable the operating forces to operate, maintain, and repair the end item within the maintenance concept defined for that end item. Logistics support encompasses the identification, selection, procurement, scheduling, stocking, and distribution of spares, repair parts, facilities, support equipment, trainers, technical publications, contractor engineering and technical services, and personnel training as necessary to provide the operating forces with the capability needed to keep the end item in a functioning status.

LOGISTICS SUPPORT ANALYSIS (LSA). A process by which the logistics support necessary for a new system equipment is identified. It includes the determination and establishment of logistics support design constraints, consideration of those constraints in the design of the "hardware" portion of the system, and analysis of design to validate the logistics support feasibility of the design, and to identify and document the logistics support resources which must be provided, as a part of the system equipment, to the operating forces. Analytical techniques used to determine limited aspects of logistics support requirements are a part of the overall LSA process. (An example would be Operational Sequential Diagramming used to determine operator tasks, task times, and skills.) The LSA identifies quantitative and qualitative requirements and the means for satisfying these requirements.

LOGISTICS SUPPORT ANALYSIS RECORD (LSAR). A single source of validated, integrated, design-related logistics data pertaining to the acquisition program. The input output formats and filing system for these records are established in a manner that best complements the technical data system of the program and assures integration of the logistics elements with design.

LOGISTICS SUPPORT DATA. Data, information, and reports required for procurement, supply, cataloging, item identification, item entry control, training, operation, maintenance, overhaul, and modification of systems and or material.

LONG LEADTIME FUNDS. Funds required to procure items in advance of the normal procurement cycle due to the longer times required to fabricate, manufacture, and deliver the required contractor or Government furnished equipment items.

LONG LEADTIME ITEMS. All items for which the contractor, because of the length of time needed to meet end article delivery schedules, considers it essential to have firm orders placed prior to normal repair parts procurement schedules, to permit delivery of the item to meet operational support dates.

LONG RANGE DEPOT MAINTENANCE PLANNING. The analysis and study of ure depot maintenance workload to identify the elements of and total capacity associated wit five-year program.

LONG SUPPLY. The situation where the total quantity of an item of materiel on hand within a military service exceeds the service's mobilization (M)-day materiel requirement for the item.

MAINTAINABILITY. A characteristic of design and installation which is expressed as the probability that, when maintenance action is performed in accordance with prescribed procedures and resources, a system or component will conform to specified conditions of utility within a given period of time. The operative period of time will be expressed, and may take a form in aggregate, such as man-hours per flying hour, clock hours to complete, or individually, as hours-to-repair, hours-to-troubleshoot.

MAINTAINABILITY ANALYSIS (MA). That portion of the logistics support analysis (LSA) process relating to the design characteristics of an item that influences its inherent ability to be maintained and supported in accordance with predetermined quantitative and qualitative objectives or requirements.

MAINTAINABILITY CHARACTERISTICS. The design and installation characteristics which influence maintenance through expenditure of manpower, material, and time.

MAINTAINABILITY PARAMETERS. Quantitative and qualitative features which are specified or assigned in order that an item may be designed to meet defined maintainability requirements or objectives. Examples of such parameters are: mean time to repair, mean time to return to service, turnaround time, scheduled maintenance frequencies, integral fault detection, rapid fault isolation, and maintenance man-hours per operating hour, etc.

MAINTAINABILITY REQUIREMENT. A comprehensive statement of required maintenance characteristics, expressed in qualitative and quantitative terms, to be satisfied by the design of an item and to make optimum use of the maintenance characteristics of an item.

MAINTENANCE. All actions taken to retain material in a serviceable condition or to restore it to serviceability. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation.

MAINTENANCE ACTIONS. Those equipment oriented physical tasks which make up maintenance production, such as service, repair, test, overhaul, modification, calibration, and inspection. (AF)

MAINTENANCE CAPABILITY. Availability of those maintenance resources namely facilities, tools, test equipment, drawings, technical publications, training maintenance personnel, engineering support, and availability of spare parts required to carry out authorized maintenance. (AF)

MAINTENANCE CAPACITY. A quantitative measure of maintenance capability, usually expressed as the amount of direct labor man-hours that can be applied within a specific industrial shop or other entity during a forty hour week (one shift for five days). Whenever the man-hour utilization figure (AFM 26-3) used as a basis for determining maintenance capacity is different, that figure will be cited in all references to the resultant maintenance capacity. (AF)

MAINTENANCE CODES. See Source, Maintenance, and Recoverability codes.

MAINTENANCE CONCEPT. The broad, planned approach to be employed in sustaining the system/equipment at a defined level of readiness or in a specified condition in support of the operational requirement. Initially started by the Government for design and support planning purposes and expanded by contractor-prepared inputs during full-scale development. Provides the basis for the maintenance plan. Usually includes guidelines pertaining to projected maintenance tasks, levels, and locations; organic/contractor maintenance work-load mix, condition monitoring, fault isolation, and testing approach; compatibility with existing support and test equipment, etc. May be influenced or modified by economic, technical, or logistics considerations as the system/equipment development proceeds.

MAINTENANCE ENGINEERING ANALYSIS. The analytical studies, decisions, and related documentation conducted in connection with the design of an item to determine the maintainability and reliability characteristics of the item and its total support requirements. It specifies the maintenance concept, maintenance requirements and tasks, maintenance personnel and training requirements, support equipment requirements, and provisioning materials support, and provides the basis for the technical manual.

MAINTENANCE ENGINEERING MANAGEMENT. The process of planning, organizing, staffing, directing, and controlling those maintenance resources (including personnel) engaged in maintenance engineering and technical support of equipment maintenance.

MAINTENANCE INTERSERVICE SUPPORT GROUP (MISG). A joint service group established on an as-required basis for specific systems/equipment. MISGs are integrated into the overall logistics management by planning for utilization of combined depot maintenance resources during the initial acquisition and early operational phase to facilitate timely decisions whereby responsibility assignments can be made.

MAINTENANCE INTERSERVICE SUPPORT MANAGEMENT OFFICE (MISMO). Individual offices, located in major command headquarters, which individually and collectively establish and ensure continuity of policies and procedures among and within AMC/NMC/AFLC and their subordinate commands.

MAINTENANCE INTERSERVICE SUPPORT OFFICE (MISO). Individual offices located in the logistics functional organizations of each service to act as the command focal point on all maintenance interservicing matters, including negotiating and implementing Depot Maintenance Interservice Support Agreements (DMISA).

MAINTENANCE LEVELS. The three basic levels of maintenance (organizational, intermediate, and depot) into which all maintenance activity is divided. The scope of maintenance performed within each level must be commensurate with the personnel, equipment, technical data, and facilities provided.

1. *Depot Maintenance.* That maintenance performed on material requiring major overhaul or a complete rebuild of parts, assemblies, subassemblies, and end items, including the manufacture of parts, modifications, testing, and reclamation, as required. Depot maintenance

serves to support lower categories of maintenance by providing technical assistance and performing that maintenance beyond their responsibility. Depot maintenance provides stocks of serviceable equipment by using more extensive facilities for repair than are available in lower level maintenance activities.

2. *Intermediate Maintenance (Field).* That maintenance which is the responsibility of, and performed by, designated maintenance activities for direct support of using organizations. Its phases normally consist of calibration, repair, or replacement of damaged or unserviceable parts, components, or assemblies; the emergency manufacture of nonavailable parts; and providing technical assistance to using organizations.

3. *Organizational Maintenance.* That maintenance which is the responsibility of, and performed by, a using organization on its assigned equipment. Its phases normally consist of inspecting, servicing, lubricating, adjusting, and the replacing of parts, minor assemblies, and subassemblies.

MAINTENANCE PARTS LIST (MPL). See Group Assembly Parts List (GAPL).

MAINTENANCE PERFORMANCE DATA. Historical information on the use and application of the work force, industrial equipment, and funds to sustain the operational status of systems and end item equipments. (AF)

MAINTENANCE PLANNING. One of the nine principal elements of integrated logistics support (ILS). Includes development of the maintenance concept, reliability and maintainability parameters, repair level determinations, maintenance requirements, and supply support essential to adequate and economical support of the system/equipment. Planning becomes more detailed as the system/equipment progresses through the acquisition cycle. Overall maintenance planning becomes a part of the Government's Integrated Logistics Support Plan.

MAINTENANCE PRODUCTION. That activity of equipment maintenance which involves the physical performance of those maintenance actions and tasks attendant to the equipment maintenance function for servicing, repairing, testing, overhaul, modification, calibration, modernization, conversion, and inspection. The accomplishment of these tasks is normally carried out at three levels comprised of organizational, intermediate, and depot maintenance. (AF)

MAINTENANCE PRODUCTION MANAGEMENT. The process of planning, organizing, staffing, directing, and controlling organic resources engaged in the physical performance of equipment maintenance. (AF)

MAINTENANCE REQUIREMENT. A qualitative or numerical value fixed by the maintenance and operational concepts and the final design, and required of using and supporting organizations in order to maintain an item in a specified condition.

MAINTENANCE RESOURCES. The personnel, materiel, tools and equipment, facilities, technical data, and dollars provided to carry out the equipment maintenance mission.

MAINTENANCE SIGNIFICANT ITEM. An item which by its application or inherent characteristics can be expected to fail or require maintenance or replacement during normal operation or maintenance of the end item.

MAINTENANCE TASK. The maintenance effort necessary for retaining an item in, or changing restoring it to a specified condition.

MAJOR COMMAND (MAJCOM or MAJCMD). The activity at the highest echelon responsible for management, command, and control of a system and/or equipment. For example, TAC, PACAF, AAC, USAFSS, AFCS and so forth. (●AF)

MAJOR END ITEM. A major piece of equipment, including support equipment, used to aid, assist, or complement a system. (AF)

MAJOR FUNCTIONAL SYSTEM. A combination of subsystems, equipment, and other lower indenture level items which are interfaced to perform a major functional action; for example, main landing gear system, pilot emergency egress system, and fire control system.

MAJOR MILESTONES. Specific or major actions to be accomplished during the course of the program which contribute to the total program success.

MANAGEMENT AIR LOGISTIC CENTER (ALC). The AFLC component defined as an ALC having management responsibility for certain weapon and/or equipment systems or components, including the related TOs. (● AF)

MANAGEMENT INFORMATION SYSTEM (MIS). Techniques, either manual or automated, making available to all echelons of management information upon which to base management decisions.

MANUFACTURERS' CODE. See Code Identification Number.

MANUAL OUTLINE. An outline of the content of a technical manual.

MARGINAL COPY. The information located in the margin, such as the publication number, page number, and the work package (WP) number. (N)

MASTER GOVERNMENT FURNISHED EQUIPMENT LIST (MGFEL). A list of all approved GFE items to be installed in the system equipment.

MATERIEL. All tangible items (including aircraft, missiles, communications-electronics-meteorological (CEM) systems, computers, and related spares, repair parts, and support equipment; but excluding real property, installations, and utilities) necessary to equip, operate, maintain, and support Air Force activities, without distinction as to its application for administrative or combat purposes. (AF)

"MAY." See definition at "SHALL."

MEAN TIME BETWEEN CORRECTIVE ACTIONS (MTBCA). The mean of the distribution of the time intervals between actions or groups of actions required to restore a failed or degraded item to a specified condition.

MEAN TIME BETWEEN FAILURES (MTBF). For a particular interval, the total functioning life of a population of an item divided by the total number of failures within the population during the measurement interval. The definition holds for time, cycles, miles, events, or other measures of life units.

MEAN TIME BETWEEN MAINTENANCE ACTIONS (MTBMA). The mean of the distribution of the time intervals between actions or groups of actions required to restore an item or to maintain it in a specified condition.

MEAN TIME TO REPAIR (MTTR). The total corrective maintenance time divided by the total number of corrective maintenance actions during a given period of time.

METHODS AND PROCEDURES TECHNICAL ORDER (MPTO). A type of TO that establishes policies and provides information and instructions on safe methods and procedures relating to preventive maintenance, periodic inspection, Air Force product improvement, maintenance management or administration, configuration management, etc. (● AF)

MISSION ESSENTIAL MATERIEL. a. That materiel which is authorized and available to combat, combat support, combat service support, and combat readiness training forces to accomplish their assigned mission. b. For the purpose of sizing organic industrial facilities, that service designated materiel authorized to combat, combat support, combat service support, and combat readiness training forces and activities, including Reserve and National Guard activities, which is required to support approved emergency and or war plans, and where the materiel is used to: (1) Destroy the enemy or the enemy's capacity to continue war; (2) provide battlefield protection of personnel; (3) communicate under war conditions; (4) detect, locate, or maintain surveillance over the enemy; (5) provide combat transportation and support of men and materiel; and (6) support training functions, but is suitable for employment under emergency plans to meet purposes enumerated above. (AF)

MILITARY STANDARD ITEM. An item approved for use by one or more of the military departments and for which the requirements are stipulated in an appropriately coordinated Military Standard (document).

MINIMUM DOCUMENTATION. The iterative nature of the engineering process requires a continual flow of information and documentation. Contractor management information program control systems, and reports emanating therefrom, shall be utilized to the maximum extent practicable. Imposed changes to existing systems shall consist only of those necessary to satisfy established engineering requirements.

MODIFICATION. A configuration change to a produced configuration item (CI). (● AF)

MODULAR REPAIR OVERHAUL. Application of maintenance procedures and techniques that concentrate attention on a defective subassembly or module and its repair or overhaul, in lieu of treating the complete assembly as an entity for all maintenance actions. (AF)

N

NATIONAL STOCK NUMBER (NSN). A 13 digit numbering system used in identifying, managing, procuring, stocking, issuing, requisitioning, disposing, and accounting for items of supply. The NSN consists of a four digit Federal Supply Classification (FSC) number and a nine digit National Item Identification Number (NIIN).

NEGATIVE. An image, usually on film or translucent base stock, in which the light and dark areas are reversed from those of the original.

NEGATIVE PRINT (INDIRECT). An image, usually on opaque base stock, in which the light and dark areas are reversed from those of the original.

NEGATIVE PROCESS. Process which reverses the light and dark areas of the original being reproduced.

NOMENCLATURE LIST. A list of standard nomenclature of the items within the end item. The list should include all common names of components and will be compiled from sources listed in the specification. (N)

NONCONFIGURED EQUIPMENT. Equipment that is representative of, but does not reflect, the current configuration of vehicles or systems in the Air Force operational inventory. The latest issues of the TO information compatible with the specific items of equipment are mandatory for use with this equipment; publication date is not necessarily listed in the Numerical Index and Requirement Table (NI&RT). (●AF)

NON-CONTRACTUAL PROVISIONS. The contractor shall identify, in the Systems Engineering Management Plan (SEMP), in house procedures and other planning baselines in sufficient detail to support the procuring activity need for visibility, validation, and verification of the contractual items. Non-contractual items will normally include the details of the engineering organization and key personnel and other coverage not appropriate for contract change control by the procuring activity.

NONREPRODUCIBLE. An image which will not absorb actinic light. The lines do not reproduce but serve only as guidelines.

NOTE. An insertion in the text of a TO when an operating procedure, condition, and so forth, is essential to highlight. (●AF) (See also WARNINGS, CAUTIONS, AND NOTES.)

NOTICE OF REVISION (NOR). A form used to propose revisions to a drawing or list and, after approval, to notify users that the drawing or list has been, or will be, revised accordingly.

NUMERICAL INDEX AND REQUIREMENTS TABLES (NI&RT). These are specific index-type TOs which show the status of TOs and provide a basis for determining distribution and requisition requirements and updating TO files and records. (● AF)

O

OFFSET. Transfer of image material from one sheet to another with which it is in contact.

ON CONDITION MAINTENANCE. Application of inspection and testing procedures and techniques, without removal or disassembly, that allows the condition of the equipment to dictate the need for maintenance or the extent of repair overhaul required to restore serviceability. (AF)

OPERATING COMMAND. The major command responsible for actual operation of equipment, regardless of who may own it. (● AF)

OPERATIONAL ELEMENT. Any element intended for Strategic Air Command (SAC), Air Force Logistics Command (AFLC), or Air Training Command (ATC) usage. (AF)

OPERATIONAL SYSTEMS DEVELOPMENT. Includes a research and development effort directed toward development, engineering, and test of systems, support programs, vehicles, and weapons that have been approved for production and service employment.

OPERATOR TASK. The operator effort necessary for activating and controlling the functions of an item toward accomplishment of the required operational mission.

OPTIMUM REPAIR LEVEL ANALYSIS (ORLA). This analysis is a guide for prospective contractors to evolve an optimum approach to level of repair or discard at failure concurrently with the definition and engineering development of a support system. Also known as level of repair analysis.

ORDERING ACTIVITY. The activity authorized to obligate the Government to procure support equipment (SE) and or related material and services.

ORGANIC MAINTENANCE. Maintenance performed by the Air Force using Air Force owned or controlled facilities (tools, test equipment, spares, repair parts) and military or DAF civilian personnel. (AF)

ORGANIZATIONAL LEVEL MAINTENANCE. That category of maintenance actions which is normally the responsibility of, and performed by, a using organization on its assigned equipment. It normally includes: (a) Servicing and moving aircraft; scheduled inspections; fault analysis and component removal, replacement, calibration; and repairs for aircraft and installed engines. (b) Servicing and moving missiles; scheduled maintenance inspections; and testing, fault analysis, component removal, replacement, calibration, and repairs for missiles and associated equipment. (c) Handling and moving munitions; loading or unloading and mating or demating munitions to the aircraft or missile; scheduled maintenance inspections, testing, preload and postload checks; component removal, replacement, limited life component, calibration, and repairs authorized

in organizational maintenance technical orders for munitions. (d) Scheduled maintenance inspections; fault isolation, component removal, replacement, calibration, and repairs for communications-electronics-meteorological (CEM) systems and equipment. (e) Servicing and moving; scheduled inspections, fault analysis, component removal, replacement, calibration, and repairs for aerospace ground equipment (AGE) (powered and nonpowered) and equipment. (f) Corrosion prevention and control. (g) Modification of materiel as directed. (AF)

ORIGINAL (MASTER) DRAWING. The initial drawing or copy thereof on which is kept the revision record recognized as official by the design activity.

OVERHAUL. The process of disassembly sufficient to inspect all the operating components and the basic end article, followed by repair, replacement, or servicing as necessary, followed by reassembly and bench check/operational/flight test. Upon completion of the overhaul process, the component/end article will be capable of performing its intended service life/service tour.

OVERHAUL DEPOT (OD). An overhaul facility assigned the responsibility to perform depot maintenance on specific systems/equipments and components. (A)

OWNING COMMAND. The major command to which the systems or equipment is officially assigned, regardless of the major command responsible for its operation or maintenance. (●AF; M)

P

PACKAGING. An all-inclusive term covering cleaning, preserving, packaging, packing, and marking required to protect items during every phase of shipment, handling, and storage.

PACKAGING DATA. Technical data and information which completely delineate all material and packaging procedures required to furnish adequate protection to supplies during shipping, handling, and storage.

PANEL GROUP (TRAINER). Two or more training panels which require mechanical assembly into a single unit in the operating condition. Individual panels or panel groups are not independently operable, and the panel group is disassembled into individual panels only for repair, relocation, or shipping purposes.

PARTIALLY VERIFED TECHNICAL ORDERS (PVTO). Formal military specification TOs on which all safety and essential verifications have been completed and that are acceptable for use in the operational environment. They are marked "Partially Verified" on the cover page and must include a verification status page, to identify unverified procedures. (●AF)

PARTICIPATING SERVICE(S). The military service(s) which uses a multi-purpose system/equipment and obtains support for it from the executive service.

PECULIAR SUPPORT EQUIPMENT (PSE). That support equipment (SE) which must be designated and developed in conjunction with the development of an end article and which does not meet the criteria of common SE.

PERFORMANCE DATA. See Equipment Performance Data and Maintenance Performance Data.

PHASED PROVISIONING. The provisioning procedure utilized when procurement of any part of the initially computed provisioning quantity is deferred and the contractor is required to accelerate manufacture of selected items in the end article production program so as to create a production buffer stock from which the selected items may be ordered in significantly reduced leadtime and replenished in time to meet the need date in the system/equipment production program.

PHOTOCOPY AND PHOTOGRAPHIC PRINTS. Products of the silver halide sensitizing or photographic materials process. They may be referred to as photoreproduction.

PHOTO-OFFSET PRINTS. Black lithographic ink lines printed on a white background.

PHYSICAL CHARACTERISTICS. Quantitative and qualitative expressions of material features, such as composition, dimensions, finishes, form, fit, and their respective tolerances.

PHYSICAL CONFIGURATION AUDIT (PCA). The formal examination of the "as-built" configuration of a unit of a configuration item (CI) against its technical documentation in order to establish the CI's initial product configuration identification.

PILOT REWORK/OVERHAUL. Pilot overhaul or repair of selected items by Government activities during both the preoperational and operational program to establish overhaul or repair capability for selected components of the system/equipment.

POSITIVE. An image, on opaque or translucent base stock or film, in which the light and dark areas appear as they exist in the original.

POSITIVE PRINT (DIRECT). An image, usually on opaque base stock, in which the light and dark areas appear as they exist in the original.

POSITIVE PROCESS. Reproduction method in which dark and light areas of the original are reproduced as such on the resultant prints.

PREFERRED WORDS. Very common words that have precise definitions for technical manual usage, and will be recognized by all technicians in the field.

PRELIMINARY DESIGN. Engineering effort prior to and including the PDR; includes requirements analysis, definition of proposed design solution, engineering testing, tradeoff studies, and preliminary performance analysis, conducted during proposal phases, preliminary study contracts, or development contracts. (AF)

PRELIMINARY GOVERNMENT FURNISHED EQUIPMENT LIST (PGFEL). A proposed preliminary GFE list of items recommended for use in the system/equipment during the contract validation phase.

PRELIMINARY INFORMATION WORKSHEET. A worksheet that can be used to detail the necessary preliminary information prior to the analysis of the task. (N)

PRELIMINARY MANUAL. An issue of a manual that has been validated but not verified. It is authorized for Fleet use until superseded by a formal manual, and is maintained as a current document until completion of verification or waiver thereof. (N)

PRELIMINARY TECHNICAL ORDER (PTO). A type of TO, which is unverified, and is reproduced in limited quantities, for use to test and verify maintenance and operation procedures against first test or early production models of equipment, and for initial training purposes. They may be in any form, including manufacturers' in-house manuals, repair or test data, and so forth. (●AF)

PREOPERATIONAL SUPPORT PROGRAM (POSP). The program under which the system/equipment contractor is required to provide logistics support during the period of time preceding the military services' support date (normally, the test and evaluation phases of a program).

PREPARING ACTIVITY. The activity that prepares the manual.

PREVENTIVE MAINTENANCE. The care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.

PRICED SUPPORT EQUIPMENT LIST (PSEL). The PSEL is the basic document reflecting proposed prices and quantities to be negotiated and exhibited by modification to the contract. It is used to negotiate prices to exhibit to the contract and to record prices in applicable publications and records.

PRIMARY FORMATS. May include any number of Formats, Subordinate Formats, and Format Components and Elements. May be used with, and may sometimes include, non-format techniques. Primary Formats are generally directed toward a single type of activity (e.g., troubleshooting) and may or may not be part of a JPA System. Primary Formats are typically complete "packages" requiring little (if any) supporting or supplemental data.

PRINCIPAL. The military service(s) or other Government agencies which obtain supply/maintenance support from the agent.

PRIVATELY DEVELOPED ITEM. An item completely developed at private expense and offered to the Government as a production article, with Government control of the article's configuration normally limited to its form, fit, and function (includes commercial items).

PROCEDURALIZATION. Placing of information in sequence by using a numbered or lettered step format, or by using dots (bullets) before each separate piece of information. (N)

PROCUREMENT LEADTIME. The interval, in months, between the initiation of procurement action and the receipt into the supply system of the production model (excludes prototypes) purchased as the result of such action. It is composed of two elements: production leadtime and administrative leadtime.

PROCURING ACTIVITY. The activitity which is assigned the responsibility for procuring or providing the supplies or services.

PRODUCT CONFIGURATION IDENTIFICATION (PCI). The current approved or conditionally approved technical documentation which defines the configuration of a CI during the production, operation, maintenance, and logistics support phases of its life cycle, and which prescribes all necessary physical or form, fit, and function characteristics of a CI, the selected functional characteristics designated for production acceptance testing, and the production acceptance tests.

PRODUCT IMPROVEMENT. A system of management actions necessary for improving the operational characteristics and/or logistics supportability of a system/equipment.

PRODUCT SPECIFICATION. A document applicable to a production item below the system level which states item characteristics in a manner suitable for procurement, production, and acceptance. A product specification which states the complete performance requirements of the product for the intended use, and the necessary interface and interchangeability characteristics is called a function or performance specification. It covers form, fit, and function. A product specification which states a detailed description of the parts and assemblies of the product, usually by prescribing compliance with a set of drawings, and those performance requirements and corresponding test and inspections necessary to assure proper fabrication, adjustment, and assembly techniques is called a fabrication, or design, specification.

PRODUCTION LEADTIME. The time interval between the placement of a contract and receipt into the supply system of material purchased.

PRODUCTION PHASE. The period from production approval until the last system/equipment is delivered and accepted. The objective is to efficiently produce and deliver effective and supportable systems to the operating units. It includes the production and deployment of all principal and support equipment.

PROGRAM DATA. Information describing service usage of a system/equipment. This information consists of usage—for example, flying hours, activities, and sites—and includes a historical summary of a specific period in the past and projects this information for a specific period in the future.

PROGRAMMED DEPOT MAINTENANCE (PDM). The rework/depot-level work package for total systems/equipment components. (AF)

PROGRAM/PROJECT. Equipment and/or skills, together with any related SE (support equipment), GFE (Government furnished equipment), training equipment, training facilities, services, information, and techniques, that form a complex or an entity capable of performing specific operational tasks in support of an identifiable DOD objective.

PROGRAM/PROJECT MANAGER (PM). A designated individual assigned the responsibility and delegated the authority for the centralized management of a particular system/project.

PROGRAM/PROJECT MANAGEMENT. A concept for the technical and business management of particular systems/projects based on the use of a designated, centralized management authority responsible for planning, directing, and controlling the definition, development, and production of a system/project; and for assuring that planning is accomplished by the organizations responsible for

the complementary functions of logistics and maintenance support, personnel training, operational testing, activation, or deployment. The centralized management authority for the execution of specifically assigned system/project tasks.

PROGRAM/PROJECT MANAGEMENT OFFICE (PMO). The military service organization established to manage the overall execution of a system/project.

PROVISIONING. The process of determining and acquiring the range and quantity (depth) of spares and repair parts and support and test equipment required to operate and maintain an end item of material for an initial period of service.

PROVISIONING DOCUMENTATION. The documentation furnished by contractors for the purpose of identification, determination of repair parts requirements, cataloging, and contractual formalization of items to be procured through the provisioning process. This includes provisioning lists, associated drawings, item descriptions, etc. (N)

PROVISIONING PARTS BREAKDOWN (PPB). The documentation for the provisioning of an end item. It lists the assemblies, subassemblies, and detail parts of an equipment, together with assigned Source, Maintenance, and Recoverability (SM&R) Codes and the related data useful in selecting spare parts support. Some documents refer to this as a Provisioning Parts List (PPL). (N)

PROVISIONING PARTS LIST (PPL). A list containing all support items which can be disassembled, reassembled, or replaced and which, when combined, constitute the end item. This list shall contain all tools and test equipment required to maintain the end item unless the provisioning requirements statement makes an exclusion statement.

PROVISIONING SOURCE CODING. The process of determining the range of repair parts required to support and maintain an end item by assignment of codes which indicate to maintenance and supply personnel the manner of acquiring items for the maintenance, repair, or overhaul of the end item(s).

PROVISIONING TEAM. Personnel assigned by the Government to select the range and quantity of supply items to be procured under the contract.

Q

QUALITY ASSURANCE. A planned and systematic pattern of actions necessary to provide adequate confidence that the item or product conforms to established technical requirements.

QUALITY CONTROL. A management function whereby control of the quality of raw or produced material is exercised for the purpose of preventing production of defective material.

R

READABILITY. The measure of verbal quality that involves the ability of a reader to absorb and retain needed information.

READING GRADE LEVEL (RGL). The level of reading commensurate with the reading capability of the target audience. (●AF)

REAL PROPERTY INSTALLED EQUIPMENT (RPIE). All equipment which is permanently attached to, integrated into, or built into Government real property.

RECOMMENDED REPAIR PARTS LIST (RRPL). The RRPL is a listing of the contractor's recommended repair parts required to maintain the contract end article item, related OE, and training equipment approved for a contractor support program during the preoperational period approved by the military services.

RECOVERABILITY CODES. See Source, Maintenance, and Recoverability (SM&R) Codes.

RECURRING DEMAND. A request, made periodically or anticipated to be repetitive, by an authorized requisitioner for consumption, use, or stock replenishment.

REFERENCE DESIGNATION. The component designation and number, such as Q3, T1, CR2, etc.

RELIABILITY. A characteristic which is used to express the probability that a system or equipment will perform a required function under specified conditions, without failure, for a specified period of time or at a given point in time.

REPAIR PARTS. Those consumable bits and pieces, i.e., individual parts or nonreparable assemblies, required for the repair of spares or major end items.

REPAIR PARTS EXHIBIT. The approved priced repair parts lists that are attached to and made a part of the contract covering the repair parts.

REPAIR PARTS ORDER (RPO). The written or confirmed orders for repair parts from the ordering activity to the contractor.

REPAIR PARTS PROGRAM PLAN (RPPP). A plan developed by the contractor that establishes milestones for the accomplishment of contractor and Government actions required to ensure delivery of repair parts preconcurrent (60 days CONUS and 90 days overseas) with the end article(s) delivery or by the Government initial operational support date.

REPETITIVE TASKS. Tasks that are repeated on the end item, usually because the same maintenance procedure is performed on similar components.

REPRODUCIBLE. Capable of use as a master for actinic printing.

REPRODUCIBLE COPY. Material suitable for reproduction, usually according to an applicable specification.

REPROVISIONING. See Initial Provisioning.

REQUIRING ACTIVITY. The activity originating a requisition or purchase request for supplies or services (not in lieu of ordering activity).

REQUIREMENT SPREAD SHEET (RSS). ADP equipment printout of GFE line item components, listing total, by fiscal year, of all production and related requirements along with their required delivery schedules.

REQUISITION DISTRIBUTION. A system of requesting and obtaining existing TOs. (●AF)

REQUISITIONING OBJECTIVE. The maximum quantities of materiel to be maintained on hand and on order to sustain current operations. It will consist of the sum of stocks represented by the operating level, safety level, and the order and shipping time or procurement leadtime, as appropriate.

RESIDENT INTEGRATED LOGISTICS SUPPORT ACTIVITY (RILSA). An activity of logisticians located at or near a contractor's plant, established by the executive service, and staffed by personnel of the executive and participating services, responsible to the logistics manager for on-site review and approval of contractor developed support requirements and data.

RETROFIT. Incorporation of an engineering change (at any level) in accepted or in service items.

RETROFIT CHANGE. A modification of a configuration item to incorporate changes made in later production items. (●AF)

RIGHT READING. Term to describe an image which is directly readable, as opposed to a mirror image. (AF)

S

SCHEDULED MAINTENANCE. Periodic prescribed inspection and/or servicing of equipment accomplished on a calendar, mileage, or hours-of-operation basis. Included in Preventive Maintenance.

SERVICEABLE. A condition of an end item in which all requirements of repair, bench check, overhaul, or modification, as applicable, have been accomplished, making it capable of performing the function or requirements for which it was originally designed. The fact that signs of previous usage are apparent does not necessarily mean that it is unserviceable. When appearance is not a primary consideration, and the condition of the item meets all safety and performance requirements, it will be processed as serviceable.

SERVICE LIFE. The time period during which the item can be maintained in service without replacement.

SERVICE TOUR MAXIMUM ALLOWABLE OPERATING TIME (MAOT). The time a system/equipment subject to overhaul or replacement is in the controlling custody of an operating command before standard rework or retirement.

SERVICING. The work required in the immediate work area to replenish consumables needed to keep an item in operating condition, providing such replenishment is not an essential part of a corrective or preventive maintenance job.

"SHALL," "WILL," "SHOULD," AND "MAY." In technical orders the words "shall" or "will" are to be used to indicate a mandatory requirement. The word "should" is to be used to indicate a nonmandatory desire or preferred method of accomplishment. The word "may" is to indicate an acceptable or suggested means of accomplishment. (●AF)

SHOP REPLACEABLE ASSEMBLY (SRA). An assembly that can be replaced at the intermediate or depot levels.

"SHOULD." See definition at "SHALL."

SITE ACTIVITY. The military service division/center/base/station, or ship responsible for physically carrying out, supporting, or actively participating in development, test, or operation of the system during the Preoperational Support Program.

SKILL. Skills involve physical or manipulative activities. They often require knowledge for their execution. All skills are actions having special requirements for speed, accuracy, or coordination. (AF)

SOFTWARE. Support effort other than hardware, tooling, and equipment. Includes such things as engineering, technical data, computer programs, etc.

SOURCE, MAINTENANCE, AND RECOVERABILITY (SMR) CODES. Uniform codes assigned to all support items early in the acquisition cycle to convey maintenance and supply instructions to the various logistics support levels and using commands. Codes are assigned based on the logistics support planned for the end item and its components. A data chain composed of three data elements: source code, maintenance code, and recoverability, in that order.

1. *Source Codes.* Assigned to indicate the manner of acquiring items for the maintenance of end items; that is, procured and stocked, manufactured or assembled. Codes occupy first and second positions of the uniform format.
2. *Maintenance Codes.* Assigned to indicate the maintenance levels authorized to perform the required maintenance functions. Codes occupy the third and fourth positions of the uniform format. First space indicates the lowest level of maintenance authorized to remove, replace, and use the item. Second space indicates whether the item is to be repaired, and identifies the lowest level of maintenance with the capability to perform the complete repair.
3. *Recoverability Codes.* Assigned to indicate the disposition action on unserviceable items. Codes occupy the fifth and sixth positions of the uniform format. Enter Code in first space. The second space is reserved for service use.

SPARES. Reparable components or assemblies used for maintenance replacement purposes in major end items of equipment. They are identical to or interchangeable with the end articles and are procured over and above the quantity needed for initial installation for support of the system/equipment.

SPECIAL PROGRAM REQUIREMENT (SPR). Expected needs for material in support of customer programs when such needs cannot be forecast by the agent based on demand history and/or the use of applicable program data.

SPECIAL TEST EQUIPMENT (STE). Test support equipment that may be expended during testing.

SPECIAL TRAINING. Any additional specialized training which is required [illegible] to properly perform maintenance on a system [illegible].

SPECIFICATION. A document intended primarily [illegible] procurement which [illegible] accurately describes the essential technical requirement [illegible] and the procedures by which it will be determined that the requirement has been met. [illegible] specifications are General Specification, Detail Specification, System Specification, D[illegible] Specification and Product Specification.

SPECIFICATION CHANGE NOTICE (SCN). A document used to propose [illegible] changes to a specification. In proposed form [illegible] SCN's [illegible] changes in the text of each page affected.

STANDARD. A document that establishes engineering and technical [illegible] items, materials, processes, methods, designs, and engineering practices.

STANDARD DEPOT LEVEL MAINTENANCE (SDLM). The rework depot [illegible] total systems equipment components. (N)

STANDARD INTEGRATED SUPPORT MANAGEMENT SYSTEM (SISMS). A [illegible] joint AMC, NMC, AFLC, AFSC, USMC (Army & Navy Materiel Commands, Air Force Logistics [illegible] Systems Commands, and Marine Corps) operating agreement and [illegible] requirements which were developed for planning and management of logistic support [illegible] systems and equipments. It delineates management responsibilities [illegible] services, and provides methodology directly or by reference [illegible] system equipment support throughout the life cycle.

STANDARD SUPPORT EQUIPMENT (SSE). An item of SE defined [illegible] approved specification or drawing, or privately developed commercial equipment [illegible] Government inventory which has been qualified to the requirement and for which [illegible] data are available.

STANDARDIZATION. The process by which the DOD achieves the closest practicable [illegible] among the services and Defense Agencies for the most efficient use of research, development [illegible] production resources, and agrees to adopt on the broadest possible basis the use of (1) common or compatible operational, administrative and logistics procedures; (2) common or compatible technical procedures and criteria; (3) common, compatible or interchangeable supplies, components, weapons, or equipment; (4) common or compatible tactical doctrine with corresponding organizational compatibility.

STORAGE COMPONENT. An AFLC component responsible for storage and [illegible] (AF)

SUBCONTRACTOR. An individual, partnership, corporation or association who (which) contracts with a contractor to design, develop, and/or manufacture items which are or were designed specifically for use in a military application.

[illegible] established categories between the Format and
CONTENT FORMATS [illegible] treatments for Formats to present
[illegible] within another usually more
[illegible] narration
[illegible] WP [illegible] SWP [illegible] as an
[illegible] WP [illegible]
[illegible] usually consisting of
[illegible] Examples are the
[illegible]

SUPPORT EQUIPMENT DELIVERY SCHEDULE/DELINQUENCY REPORT (SEDSDR). Delivery schedule information which shall be furnished by the contractor on a line item delivery schedule for each item of SE on the contract, as ordered by the Government. The delivery schedule information is reviewed and evaluated by the Government to ensure timely delivery of support for the end articles on contract. When approved by the Government, the line item delivery schedule is incorporated in the contract by the administrative contracting officer (ACO). The delinquency delivery report for SE is prepared and submitted by the contractor to notify the Government of those items which are delinquent, are anticipated to become delinquent, or for which previously approved delivery dates cannot be met.

SUPPORT EQUIPMENT END ITEM (SEEI). A unit of SE that is complete within itself and performs a desired function.

SUPPORT EQUIPMENT END ITEM FUNDING REPORT (SEEIFR). A report covering all SE costs incurred, required, or planned against the SE line item on the end article(s) contract. This report is used by the Government for tracking status of budgeting and funding in support of the end article(s) on contract.

SUPPORT EQUIPMENT EXHIBIT. The approved, priced SE list which is attached to and or made a part of the contract.

SUPPORT EQUIPMENT ILLUSTRATION (SEI). A pictorial illustration of an SE item together with functional and technical description, including operating, performance, and design characteristics, and related data necessary to fully describe the item.

SUPPORT EQUIPMENT INSTALLATION DATA (SEID). Data which covers SEID, associated information, and drawings.

SUPPORT EQUIPMENT PLAN (SEP). Outlines the contractor plan for the SE programs for an end article.

SUPPORT EQUIPMENT RECOMMENDATION DATA (SERD). The contractor's recommendation for SE to support the end article. It provides sufficient engineering data for review of the function requiring support, together with the recommendation for development or procurement of an item to satisfy one or more functions. The SERD also provides availability, allowance, and logistics support information decision regarding the SE item recommended.

SUPPORT MANAGER (SM). The cognizant Inventory Control Point (ICP) responsible for support of the system on the service support date. (N: N)

SUPPORT MATERIAL LIST (SML). A composite listing of all approved contractor furnished and Government furnished spares, repair parts, and peculiar and common SE approved to be provided for support of all military services preoperational programs.

SUPPORT SYSTEM ENGINEERING. The application of engineering and technical skills to the definition and development of the support system. Includes the function of Support Engineering, which interfaces the support system with the equipment system, and defines support criteria as input to the equipment design process and the support system optimization process.

SYSTEM. A composite of subsystems, assemblies (or sets), skills, and techniques capable of performing and/or supporting an operational (or nonoperational) role. A complete system includes related facilities, items, material, services, and personnel required for its operation to the degree that it can be considered a self-sufficient item in its intended operational (or nonoperational) and/or support environment.

SYSTEM ANALYSIS. The process of examining the parts of a system or subsystem in detail to determine (a) the capabilities of the system, (b) whether the system meets its overall requirements, and (c) whether the requirements are sufficiently defined. (AF)

SYSTEM EFFECTIVENESS. A measure of the extent to which a system may be expected to achieve a set of specific mission requirements. It is a result of system availability, dependability, and capability. (AF)

SYSTEM ENGINEERING. A logical sequence of activities and decisions transforming an operational need into a description of system performance parameters and a preferred system configuration. (AF)

SYSTEM MANAGER/ITEM MANAGER (SM/IM). The Air Logistics Center, or individual therein, having assigned responsibility for maintenance and support of a particular Air Force system (SM) or item of equipment (IM) following transition from Air Force Systems Command. Acts as TO Management Agency when Air Force Logistics Command has been assigned acquisition responsibilities, and ensures that logistics actions within ALC are in consonance with program objectives and using command support requirements. (AF)

SYSTEM REQUIREMENTS ANALYSIS (SRA). A sequential and iterative engineering process designed to establish the functional requirements for each element of a weapon system. The process provides a logical sequence and a clear record of the development of system requirements to manage the system engineering effort throughout all phases of system acquisition. (AF)

SYSTEM SPECIFICATION. A document which states the technical and mission requirements for a system as an entity, allocates requirements to functional areas (or configuration items), and defines the interfaces between or among the functional areas.

SYSTEM TEST BED. Any location at which the combination of two or more weapon system subsystems from two or more contractors is tested.

T

TABLE OF COMPONENTS. A requirement on wiring diagrams (refer to the applicable specification).

TASK. A task is a related set of activities directed toward a purpose. A task has a definite beginning and end. A task involves an individual's interaction with equipment, other people, and/or media. A task, when performed, results in a meaningful product, an advance toward a goal, or completion of a step in a sequence. A task includes a mixture of decisions, perceptions, and/or physical (motor) activities required of a person. A task may be of any size or degree of complexity, but it must be directed toward a specific purpose or output. (AF)

TASK ANALYSIS - The detailed analysis of each task on the Task Identification Matrix. (N)

TASK DEVELOPMENT - The first three processes in the development of a technical manual: Documentation Analysis, Task Identification and Task Analysis. (N)

TASK IDENTIFICATION - The *identification of the maintenance* tasks necessary in maintaining hardware or equipment. (N)

TASK IDENTIFICATION MATRIX (TIM) - The form on which all possible tasks for each hardware item are identified. (N)

TASK REFERENCE NUMBER - A composite number taken from the Task Identification Matrix. (N)

TECHNICAL CONTENT - The statement of technical requirement or instruction contained in TOs. (●AF)

TECHNICAL DATA - One of the nine principal elements of *integrated logistics support* (ILS). Consists of recorded information, regardless of form or characteristic, of a scientific or technical nature. Technical data is an overall term used when referring collectively to such items as engineering data, reprocurement data, and TO data (for example, schematic diagrams, flow diagrams, manufacturer's initial handbooks, manuscripts of operating and maintenance instructions, preliminary technical orders (PTOs), commercial technical manuals, R&D technical manuals, and other system or equipment operating and maintenance procedures developed under AFSC or AFLC direction during the system acquisition phases). Avoid use of this term when referring to specific types of data. Technical data do not include financial, administrative, cost and pricing, and management data, or other information incidental to contract administration. (●AF, M)

TECHNICAL MANUAL (TM) - A type of TO containing instructions designed to meet the needs of personnel engaged or being trained in the operation, maintenance, service, overhaul, installation and inspection of equipment and material. The TM may deal with specific aircraft, missiles, communications-electronics, meteorological (C-E), systems, and items of equipment, or may be a general [illegible] dealing with a subject area such as welding or painting procedures, and so forth. (●AF)

TECHNICAL MANUAL (TM) - A publication containing a description of equipment, weapons, or weapon systems with instructions for effective use, including one or more of the following sections as required: instructions covering initial preparation for use, operational instructions, maintenance instructions, overhaul instructions, modification instructions, inspection procedures, parts lists or parts breakdown, and related technical information or procedures exclusive of those of an administrative nature. (M)

TECHNICAL MANUAL SPECIFICATIONS AND STANDARDS (TMSS) - A DOD directed plan and program for consolidation and improvement of technical manual specifications and standards.

TECHNICAL OBJECTIVE - Technical objectives are established for each program so that meaningful relationships among need, urgency, risks, and worth can be established.

TECHNICAL ORDER (TO). A military order of a technical nature issued in the name of the Chief of Staff, USAF, and by order of the Secretary of the Air Force. It provides technical information and instructions to operate, install, maintain, inspect, or modify Air Force systems and equipment items. They are publications described in AFR 8-2 and TO 00-5-1, which are distributed according to TO 00-5-2. Types of TOs authorized are: Technical Manuals (TM); Methods and Procedures Technical Orders (MPTO); Time Compliance Technical Orders (TCTO); Index Technical Orders; Abbreviated Technical Orders; Preliminary Technical Orders (PTO); Joint Nuclear Weapons Publications (JNWP). (●AF)

TECHNICAL ORDER COMPLIANCE (TOC). That state in which, in accordance with a USAF Technical Order or other military department orders, an otherwise serviceable article must be processed by a maintenance activity for inspection, *calibration*, test, modification, change, or alteration *prior* to shipment, issue, installation, or preparation for initial or continued storage or use. (●AF)

TECHNICAL ORDER CONTROL UNIT (TOCU). Field unit(s) under the direction of the CTOCU, whose primary function is to implement, manage, and control the TO quality assurance program at a particular site and/or field location. These units are normally composed of *representatives* from AFSC, AFLC, using command(s), and contractors. Their location and chairmanship is as designated by Air Force Systems Command. (●AF)

TECHNICAL ORDER DISTRIBUTION ACCOUNT (TODA). An activity served by a TO distribution office (TODO). (●AF)

TECHNICAL ORDER DISTRIBUTION CONTROL ACTIVITY (TODCA). The organizations at ALCs which are responsible for logistical management of assigned TOs, including receipt, storage, packaging, shipment, distribution management, *approval*, direction, and stock control of TOs and *related publications*. TODCAs may be ALC TO Systems Sections or Air Base Group Administration Publications Branches. (●AF)

TECHNICAL ORDER DISTRIBUTION OFFICE (TODO). An activity assigned a TO distribution code number to receive direct TO distribution service. There may be several TODOs authorized on an installation. (●AF)

TECHNICAL ORDER FILE. A file of one or more TOs maintained for continuing use, and therefore requiring distribution of all changes, revisions, and applicable supplements needed to constitute an authorized TO file in accordance with the provisions of TO 00-5-2. (●AF)

TECHNICAL ORDER MANAGEMENT AGENCY (TOMA). The Air Force Systems Command or Logistics Command activity responsible for ensuring during the acquisition period that TOs for a specific system, item of equipment, or modification are prepared and delivered in accordance with contractual requirements. (●AF)

TECHNICAL ORDER PAGE SUPPLEMENT (TOPS). A type of TO *supplement* consisting of a title page and *individual data pages*. The TOPS title pages are filed in front of the existing TO title page. The existing TO title page and its list of effective pages are retained and NOT removed.

Only the latest TOPS title page is retained when a new TOPS title page is issued and the list of effective pages is cumulative and includes all active TOPS pages. TOPS data pages are filed opposite (facing) the affected TO page. (● AF)

TECHNICAL ORDER PUBLICATION PLAN (TOPP). A contractor prepared plan according to the terms of the contract and data item description outlining the general procedures, terms, and conditions governing the planning, selection, preparation, validation, verification, and delivery of TOs. It identifies requirements for training, maintenance, and operational support of the system or equipment being procured. The TO Publication Plan is managed by the procuring TOMA, and includes both contractor and organic planning. While generally not included in TO System, RPIE manuals may be included in the TO plan for scheduling and control purposes. (● AF)

TECHNICAL ORDER REVIEW BOARD (TORB). Designated personnel of a supervisory level that review recommendations for changes to preliminary TOs and recommend the transition of preliminary TOs to formal TOs after satisfactory completion of TO verification. This review board is composed of personnel from the implementing command, support command, and applicable contractor and government quality assurance organizations (AFPRO, AFCMD, etc.). Engineering and safety personnel may participate for consultation with the board as required. The TORB is chaired by the Verification Team Manager (VTM) or a designated representative. (● AF)

TECHNICAL ORDER SUPPLEMENT. Subsidiary TOs issued to update or complement the information in basic TOs. (● AF)

TECHNICAL PERFORMANCE MEASUREMENT. The continuing prediction and demonstration of the degree of anticipated or actual achievement of selected technical objectives. It includes an analysis of any differences among the values for "Achievement to Date" and "Current Estimate" and the specification requirement. "Achievement to Date" is the value of a technical parameter estimated or measured in a particular test and or analysis. "Current Estimate" is the value of a technical parameter predicted to be achieved at the end of the contract within existing resources.

TECHNICAL PROGRAM PLANNING AND CONTROL. The management of those design, development, test, and evaluation tasks required to progress from an operational need to the deployment and operation of the system by the user.

TEST PLANNING ANALYSIS (TPA). A technical iterative process utilized to establish the test requirements and test support requirements. The test planning analysis is developed using the system requirements analysis data and the subsystem design data. The test support requirements, including operational hardware and software, test facilities, test support equipment, special test equipment, range support, technical data, and personnel, are defined in the test planning analysis. (AF)

TIME COMPLIANCE TECHNICAL ORDER (TCTO). A type of TO which sets forth instructions for accomplishing a modification to equipment, performing or initiating special "one time" inspections, or imposing temporary restrictions on aircraft flight, missile launch or usage of airborne, ground communications electronics equipment and support equipment. (● AF)

TOOTH. Surface receptivity to pencil or ink. (AF)

TOP DOWN BREAKDOWN. The disassembly sequence of the equipment or hardware, with the top item being the complete equipment. (N)

TOPICAL ASSEMBLY. The assembly of data in a manual according to topic, as opposed to the WP assembly of data, which is according to the functional tasks that the technician must perform. (N)

TRAINING AID. Training aids are restricted to those items of training material, generally minor in nature, which fall outside the definitions of training devices and operational equipment used in training.

TRAINING DEVICE. Equipment designed exclusively for training purposes, to demonstrate or illustrate a concept or to provide a simulated system in which a student's skill or technique is developed or improved. Operational equipment is included in the definition where it is installed as part of a specific training device.

TRAINING EQUIPMENT. All types of maintenance and operator's training hardware, devices, visual audio training aids, and related software which are used to train maintenance and operator personnel by depicting, simulating, or portraying the operational or maintenance characteristics of an item, system, or facility, and must, by their nature, be kept consistent in design, construction and configuration with such items in order to provide the required training capability.

TRAINING MATERIAL. All hardware and software used in and for training, except aircraft and ships. It includes training devices, training aids, training publications and films, and operational equipment used for training.

TRAINING SUPPORT DATA. Data used when referring collectively to contractor-prepared drawings, in house documents, commercial manuals, procedural support data, development program manuals, or preliminary TOs that are to be obtained for Air Training Command (ATC) training purposes. (●AF)

TRANSLUCENT. Semi-transparent: not clear, but capable of transmitting diffuse light.

TRANSPARENCY. Print to be viewed by transmitted light. Hence, a print on transparent base stock.

TRANSPORTABILITY. The inherent capability of material to be moved by towing, self propulsion, or by carrier via railways, highways, waterways, pipelines, and or airways.

TRANSPORTABILITY AGENCY. The service headquarters organization designated to execute the transportability program.

TRANSPORTABILITY CRITERIA. Those limiting or restrictive physical characteristics and critical environments inherent in transportation systems covering the largest possible representative area of the world.

TRANSPORTABILITY FIELD TESTING. Physical examination and/or test of an end item of military equipment or related material in order to identify, analyze, classify its components and transportability characteristics, and determine the optimum loading, blocking, bracing, lifting, and tie down arrangement.

TRANSPORTABILITY GUIDANCE. Information needed during loading, securing, and movement operations to ensure safe and effective transportation of an end item of military equipment or components over railways, highways, waterways, oceans, airways, and overland by carrier, towed, or by self propulsion.

TRANSPORTATION DATA. Technical data or information essential to the movement of material within the DOD or commercial transportation system.

TRANSPORTATION RELATED MATERIALS HANDLING EQUIPMENT. Mechanical devices and aids for handling supplies, components, spares, repair parts, and equipment during any segment of transportation.

TURNAROUND TIME (MAINTENANCE). That element of maintenance time needed to service or check out an item for recommitment.

TURNAROUND TIME (MATERIAL). The interval between the time when an end item, weapon, or a reparable item of supply is removed from use and the time when it is available for reissue in a serviceable condition.

TWO STEP VERIFICATION. A concept used when verification cannot be completed in time to provide fully verified TOs with first delivered operational systems or equipment. Preliminary TOs are used to accomplish safety and essential verifications. Then, formal military specification TOs are prepared with the cover page marked "Partially Verified," and a verification status page is used to identify unverified procedures. A verification organization is named by each affected operating command, with System Manager concurrence, to complete nonsafety and nonessential verifications during a period not to exceed 2 years. Management and distribution are according to TO 00-5-1 and -2, respectively, with the contractor responsible for correction of errors and deficiencies under warranty provisions. (●AF)

U

UNIT. One complete configuration item. For example, one F-111A of a total quantity of 100 F-111As.

UNSCHEDULED MAINTENANCE. Those unpredictable maintenance requirements that had not been previously planned or programmed but which require prompt attention and must be added, integrated with, or substituted for previously scheduled workloads.

UPDATING CHANGE. A modification to correct deficiencies identified prior to Program Management Responsibility Transfer (PMRT). (●AF)

UPDATING CHANGE MODIFICATION PROOFING. The actual trial installation, in accordance with a proposed TCTO, of the first production modification TCTO kit. Such proofing must be successfully accomplished by the ultimate installer of the TCTO prior to release of quantities of TCTO kits to installing agencies.

UPTIME. That portion of total time during which an item is either ready, reacting, or performing a mission.

USABILITY. The quality of a manual that determines its effectiveness in aiding the technician in maintaining the hardware for which the manual was developed. In short, its effectiveness as an aid to the technician.

USING COMMAND OR AGENCY (USER AND OPERATOR). The major command which has responsibility for operation and maintenance of a system or item of equipment. (● AF)

V

VALIDATION. The process by which the contractor tests maintenance procedures in the proposed TOs for technical accuracy, adequacy, completeness, and compatibility with the requirements of the applicable military specifications. Validation is conducted at the contractor's facility or at the operational site, and entails the actual performance of operating and maintenance procedures. It includes configuration, inspection, circuit analysis, troubleshooting, checkout, calibration, alignment, fault isolation, removal, repair and replacement instructions, associated checklists, and computation of reading grade levels (RGL) according to MIL-M-38784, in conformance with RGLs specified by the procuring activity. (● AF)

VALIDATION PHASE. The period when major program characteristics are refined through extensive study and analyses, hardware development, test and evaluations. The objective is to validate the choice of alternatives and to provide the basis for determining whether or not to proceed into full-scale development.

VALUE ENGINEERING (VE). An organized effort directed at analyzing the function of systems, equipments, facilities, procedures, and supplies for the purpose of achieving the required function at the lowest total cost of effective ownership, consistent with the necessary requirements for performance, reliability, quality, and maintainability.

VENDOR. A manufacturer or supplier of a commercial item.

VENDOR ITEM. An item used in or attached to the article produced by the contractor, which is procured by the contractor in the open market or from established sources and for which the contractor is not the manufacturing activity.

VERIFICATION. The process by which TOs are tested and proved (by Air Force personnel under Air Force jurisdiction) to be clear, logical, and adequate for operating and maintaining associated equipment and for certifying that TOs are compatible with the pertinent hardware, tools, and support equipment. Verification consists of the actual performance of procedures by the using

command and the testing personnel, in the operational environment, utilizing applicable maintenance instructions and checklists. Normally, initial Technical Orders are verified during development test and evaluation (DT&E); however, verification may continue into operational test and evaluation (OT&E) if necessary. (●AF; M)

W

WAIVER. A written authorization to accept a configuration item or other designated items which, during production or after having been submitted for inspection, are found to depart from specified requirements, but are nevertheless considered suitable for use "as is" or after rework by an approved method.

WARNING. An insertion in the text of a TO when an operating procedure, practice, and so forth, if not correctly followed, could result in personal injury, or loss of life. (●AF) (See also, WARNINGS, CAUTIONS, AND NOTES.)

WARNINGS, CAUTIONS, AND NOTES. Insertions in the text of a TO which are used to call attention to special hazards or other essential information relating to the discussion. They convey important or critical procedural instructions. Their order of urgency is: warnings, cautions, and notes. (●AF)

WEAPON SYSTEM. A final combination of subsystems, components, parts, and materiel which makes up an entity utilized in combat, either offensively or defensively, to destroy, defeat, injure, or threaten the enemy. An example is the F-4 aircraft.

WHOLESALE INTERSERVICE SUPPLY SUPPORT AGREEMENT (WISSA). Wholesale inter-service interagency supply support, including management and the providing of spares and repair parts by an inventory control point (ICP) of one military service or Government agency.

"WILL." See definition at "SHALL."

WORK BREAKDOWN STRUCTURE (WBS). A product-oriented family tree, composed of hardware, software, services, and other work tasks, which results from a project engineering effort during the development and production of a defense material item, and which completely defines the project or program. A WBS displays and defines the product(s) to be developed or produced and relates the elements of work to be accomplished to each other and to the end product. See MIL-STD-881 for definitions of WBS elements.

WORKLOAD SCHEDULING. The processes of determining/assigning depot maintenance workloads within each military service's depot repair/contract facilities.

WORK UNIT CODE (WUC). A code assigned to functionally identify the system, subsystem, assembly, component, and significant reparable part on which maintenance is to be performed. Mission essential and time change nonreparable components are also given a WUC.

SECTION 2. LIST OF ABBREVIATIONS AND ACRONYMS

This section presents a comprehensive listing of abbreviations and acronyms, with full title, that may confront the TO Manager or Specialist. Emphasis has been placed on the terms that are used in the technical data development discipline, either as part of the process, or in related fields. Many are used within this technical report; others will be found in the input and source data that the TO Specialist must use. Most of the terms and their full titles are based on "official" glossaries. Some are not, but are nevertheless part of the languague of system and technical data development. In a few instances, where a term is unique to a particular service, and the relationship is not clear, identification of the service is shown in parenthesis following the full title. Organizational codes, and intermediate and lower level organizational abbreviations have been excluded since they are subject to frequent change.

Many of the titles listed here are explained more fully in Section 1. Titles which are, or have been proposed as, Job Performance Aid (JPA) concepts and techniques are noted with an asterisk after the short title. Amplifying information on most of these "JPAs" is provided in Section 4; some are fully described in AFHRL TR 80-50, Sections 4 and 5.

A

AA	Approving Authority
AAT*	Augmented Action Tree
AB	Air Base
AB	Allocated Baseline
ACEP*	(Title Unknown)
ACFT	Aircraft
ACI	Allocated Configuration Identification
ACMS	Advanced Configuration Management Systems
ACN	Advance Change Notice
ACO	Administrative Contracting Officer
ACO	Assembly and Checkout
A&CO	Assembly and Checkout
A&COTA	Assembly and Checkout Technical Analysis
ACPT	Acceptance
ADL	Authorized Data List
ADDS*	Advanced Data Delivery Systems
ADMIRE*	Automated Diagnostic Maintenance Information Retrieval
ADP	Automatic Data Processing
ADPEP*	Automatic Data Preparation Evaluation Program
ADPREPS*	Automated Documentation Preparation System
AFAD	Air Force Acquisition Document
AFB	Air Force Base

*Job Performance Aid Concept or Technique (Actual or Proposed)

AFCMD	Air Force Contract Management District
AFCS	Air Force Communications Service
AF FPJPA*	Air Force Fully Proceduralized Job Performance Aids
AFHRL	Air Force Human Resources Laboratory
AFIT	Air Force Institute of Technology
AFLC	Air Force Logistics Command
AFLCM	Air Force Logistics Command Manual
AFLCR	Air Force Logistics Command Regulation
AFM	Air Force Manual
AFMP	Aircrew Flight Manuals Program
AFPRO	Air Force Plant Representative Office
AFR	Air Force Regulation
AFS	Air Force Specialty
AFS	Air Force Standard
AFSC	Air Force Systems Command
AFSC	Air Force Specialty Code
AFSCM	Air Force Systems Command Manual
AFSCR	Air Force Systems Command Regulation
AFSI	Air Force Standard Item
AF SIMS*	Air Force Symbolic Integrated Maintenance System
AFTEC	Air Force Test and Evaluation Center
AFTOSB	Air Force Technical Orders Standardization Board
AGCS*	Alden Graphic Communication System
AGE	Aerospace Ground Equipment
AGMC	Aerospace Guidance and Metrology Center
AGS	Aircraft Generation Squadron
AGSP	Automated Graphic Science Program
AIA	Aerospace Industries Association
AICO	Assembly, Installation and Checkout
AIDUS	Automated Input and Document Update System
AIS*	Audio Information System
ALC	Air Logistics Center (USAF)
ALCC	Airborne Launch Control Center
ALT	Administrative Lead Time
AMC	Army Materiel Command
AMPS*	Aegis Maintenance Publications System
AMSAS*	Advanced Manpower Concepts for Sea-based Aviation Systems
AMU	Aircraft Maintenance Unit
AN	Army/Navy Standard
AN/GSM-133*	AN/GSM-133 Programmer Comparator
ANA	Army, Navy, Air Force
ANL*	Army New Look
APP	Advanced Procurement Plan

AQL	Acceptable Quality Level
AR	Aeronautical Requirement
AR	Army Regulation
ARI	Automated Reading Index
ARI	Army Research Institute
ARMCOM	Armament Command (Navy)
ARP	Alternative Release Procedure
ASCII	American Standard Code for Information Interchange
ASD	Aeronautical Systems Division (USAF)
ASD (I&L)	Assistant Secretary of Defense (Installations & Logistics)
ASL	Average Sentence Length
ASMSA*	(Title Unknown)
ASPR	Armed Services Procurement Regulation
ASSY	Assembly
ATC	Air Training Command (USAF)
ATE	Automatic Test Equipment
ATIM	Annotated Task Identification Matrix
ATOMS*	Automated Technical Order and Maintenance Sequence
ATOS	Automatic Technical Order System
ATS*	Administrative Terminal System
ATS*	Aircraft Troubleshooting System
AT&SS	Assembly, Test, and System Support
AU	Administrative Unit
AUTODIN	Automatic Digital Information Network
AUTOMN	Automation
AUTOTEC	Automated Text Composition
AUTOTEXT*	Automated Text Publication System
AVE	Aerospace Vehicle Equipment
AVIPU*	Audio Visual Industrial Production Unit
AVIS*	Audio-Visual Information System
AVSCOM	Aviation Systems Command (Army)
AWL	Average Word Length

B

BA*	British Algorithm
BAMAGAT*	Block-A-Matic-A-Gram-A-Text
BFIC*	Binary Fault Isolation Chart
BFTA*	Block Form Troubleshooting Aids
BII	Basic Issue Item
BIIL	Basic Issue Item List
BITE	Built-In Test Equipment
BOA	Basic Ordering Agreement
BOB	Bureau of the Budget

BOI	Basis of Issue
BPAC	Budget Program Activity Code
BSD*	Blocked Schematic Diagram
BTA	Behavioral Task Analysis
BTODO	Base Technical Order Distribution Office
BUMED	Bureau of Medicine (Navy)
BUPERS	Bureau of Naval Personnel

C

C-141*	C-141 Aids: C-141 Job Guides
CA	Correct. Action
CAD	Computer-Aided Design
CALDR*	Computer-Aided Loop Diagram Representations
CALP*	Computer-Assisted Logical Processes
CAM	Computer-Aided Manufacture
CAO	Contract Administration Office
CAPADAP*	Computer-Aided Performance Aid Development and Production
CAPT*	Computer-Aided Preparation of Text
CAS	Contract Administration Services
CATA*	Computer-Aided Trouble Analysis
CBIL	Common and Bulk Items List
CBL	Conceptual Baseline
CC	Configuration Change
CCB	Configuration Control Board
CCBD	Configuration Control Board Directive
CCMO	Commodity Configuration Management Systems
CCN	Contract Change Notice (or Notification)
CCP	Central Control Point
CCP	Contract Change Proposal
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CEI	Contract End Item
CEI/FAC	Contract End Item/Facility
CEIN	Contract End Item Number
CEL	Contractor Experience List
CEM	Communications Electronics Meteorology
CER	Complete Engine Repair
CETS	Contract Engineering and Technical Services
CF	Conversion Factor
CFA	Cognizant Field Activity
CFAE	Contractor-Furnished Aeronautical Equipment
CFE	Contractor-Furnished Equipment
CF/TA	Cognizant Field/Technical Activity

CFS	Contractor Field Service
CG	Commanding General
CG	Content Generation
CGPR	Cognizant Government Plant Representative
CGVMS*	Computer Graphics and Visual Module System
CHK	Check
CHRT	Coordinated Human Resource Technology
CI	Configuration Item (or Identification)
CIC	Combat Information Center
CII	Configuration Identification Index
CIMM	Commodity Integrated Materiel Manager
CIP	Contractor Inspection Point
CJCP	Congressional Joint Committee on Printing
CKT	Circuit
CL	Check List
CLID	Calendar Life Identified
CMA	Contract Management Activity
CMDN	Catalog Management Data Notification
CMG*	Condensed Maintenance Guide
CMRS	Calibration Measurement Requirements Summary
CNET	Chief of Naval Education and Training
CNETSSCPAC	Chief of Naval Education Training Service Support Center Pacific
CNM	Chief of Naval Materiel
CNTT	Chief of Naval Technical Training
COC	Certificate of Conformance
CODN	Component Operational Data Notice
COM	Computer Output Microform
COMSAT	Commercial Satellite System
CONSD*	Condensed Servicing Data
CONTENT*	Content Indexing Technique
CONUS	Continental United States
COR	Contracting Officer Representative
COST*	Concentrated Odor Sensing Technique
CPCI	Computer Program Configuration Item
CPFF	Cost Plus Fixed Fee
CPIF	Cost Plus Incentive Fee
CPO	Command Project Officer
CPS	Contractor Plant Services
CRC	Command and Reporting Center (Navy)
CRS	Component Repair Squadron
CRT	Cathode Ray Tube
CS	Computer Software
CSE	Common Support Equipment

CSEL	Consolidated Support Equipment List
CSP	Continuous Sampling Plan
CT	Checkout Tape
CTA	Cognizant Transportation Agency
CTM	Contract Technical Manager
CTM*	Conventional Technical Manual
CTO	Cognizant Transportation Office
CTOCU	Central Technical Order Control Unit

D

DA	Department of the Army
DACOM*	Data Communicator
DACOM*	Datascope *Computer Output Microfilmer*
DAPIL	Digital Assembly Parts Identification List
DAR	Data Automation Requirements
DAR	Defense Acquisition Regulation
DARCOM	Development and Readiness Command (Army)
DATOM*	Data Aids for Training, Operation, and Maintenance
DAW	Data Accumulation Worksheet
DCAS	Defense Contract Administration Service
DCASQ	Defense Contract Administration Service Quality
DCASR	Defense Contract Administration Services Region
DCF	Degradation Conversion Factor
DCM	Deputy Commander for Maintenance
DCN	Design Change Notice
DCSLOG	Deputy Chief of Staff for Logistics
DDC	Defense Documentation Center
DDD	Direct Distance Dialing
DEP	Development Equipment Publication(s)
DID	Data Item Description
DIMATE*	Depot Installed Maintenance Automatic Test Equipment
DIODS	Diagram Oriented Documentation System
DIR	Disassembly Inspection Report
DD	Defense Department
DLAO	Defense Logistics Analysis Office
DLPA*	Dual Level *Performance* Aid
DLSC	Defense Logistics Services Center
DMAAC	Defense Mapping Agency Aerospace Center
DMI	Descriptive Method Identification
DMISA	Depot Maintenance Interservice Support Agreement
DMO	Data Management Office(r)
DMRI	*Depot Maintenance Reparable Item*
DMWR	Deferred Maintenance Work Requests

DOD	Department of Defense
DODAAD	Department of Defense Activity Address Directory
DODADL	Department of Defense Authorized Data List
DODISS	Department of Defense Index of Specifications and Standards
DOP	Designated Overhaul Point
DOR	Date of Request
DOT	*Department* of Transportation
DPM	Development Program Manual
DR	Deficiency Report *or* Discrepancy Report
DRT	Distribution Requirements Table
DS	Direct Support
DSA	Defense Supply Agency
DSA*	Diagnostic Sonic Analyzer
DSAM	Defense Supply Agency Manual
DSAR	Defense Supply Agency Regulation
DSARC	Defense System Acquisition Review Council
DSE	Depot Support Equipment
DSF	Delivery Status Factor
DS/GS	Direct Support General Support
DSIWG	Development Support Interface Working Group (USAF)
DTC	Design To Cost
DTE *or* DT&E	Development Test and Evaluation
DTIC	Defense Technical Information Center
DTNSRDC	David Taylor Naval Ship Research & Development Center
DTS	Defense Transportation System

E

EA	[illegible] Attack
EBCDIC	Extended Binary Coded Decimal Interchange Code
EC	Engineering Change
ECD	Engineering Change Document
ECMS	Engine Configuration Management Systems
ECN	Engineering Change Notice
ECOM	Electronics Command
ECP	Engineering Change Proposal
ECR	Engineering Change Request
ED	Engineering Drawing *or* Engineering Design
EHJPA*	Enriched Hybrid Job Performance Aid
EI	End Item
EIS	End Item Specification
ELECTROCULAR*	Electronic Ocular System
ELTTA*	Enriched Logic Tree Troubleshooting Aids
EMFO*	Evaluation of Microprinting by Fotolithographic Offset

EMS	Equipment Maintenance Squadron
ENGS	Engines
EO	Engineering Order
EOD	Explosive Ordnance Disposal
EPC	Editorial Processing Center
EPICS	Enlisted Personnel Individualized Career System (Navy)
EPOE	End Piece of Equipment
EQPT	Equipment
ER	Established Reliability
ETM*	Extension Training Materials

F

FASTI*	Fast Access to System Technical Information
FB *or* FBL	Functional Baseline
FBR	Feedback Report
FCA	Functional Configuration Audit
FCAS	Foreign Contract Administration Services
FCB	Field Change Bulletin
FCI	Functional Configuration Identification
FDT	First Destination Transportation
FEA	Front End Analysis
FED	Federal
FEFI*	Flight Engineer's Fault Isolation
FEFI/TAFI*	Flight Engr's Fault Isolation/Turn Around Fault Isolation
FFP	Firm Fixed Price
FGC	Functional Group Code
FI	Fault Isolation
FIIG	Federal Item Identification Guide
FILESEARCH*	Filesearch System
FIM*	Fault Isolation Manual
FIMATE*	Field Installed Maintenance Automatic Test Equipment
FIPS	Federal Information Processing Standard
FIRM*	Fault Isolation Reporting Method
FIST*	Fault Isolation by Semi-automatic Techniques
FLAPS*	Functional Layout and Presentation System
FLTSATCOM	Fleet Satellite Communications (Navy)
FM	Field Manual (Army)
FM	Flight Manual (USAF)
FMA	Failure Mode Analysis
FMCO	Flight Manual Control Officer
FMEA	Failure Mode and Effects Analysis
FMM	Flight Manual Manager

FMS	Foreign Military Sales
FO	Format Option
FOB	Freight On Board
FOE	Features of Effectiveness
FOMIS	Fleet Ordnance Maintenance Information System (Navy)
FOMM*	Functionally Oriented Maintenance Manuals
FORECAST*	Fox, Ford, Caylor, Sticht
FORECASTE*	Enriched FORECAST
FOSDIC	Format Option Selection Depending on Interaction of Conditions
FP	Film Pack
FP	Fixed Price
FPJPA*	Fully Proceduralized Job Performance Aids
FPTA*	Fully Proceduralized Troubleshooting Aids
FR	Fault Reporting
FSC	Federal Supply Class
FSC	Federal Supply Code
FSCM	Federal Supply Code for Manufacturers
FSR	Field Service Representative
FSS	Federal Supply Schedule
FTD	Field Training Detachment
FT/FH	Flight Time/Flight Hour
FTO	Formal Technical Order
FTORB	Flight Technical Order Review Board

G

GAM*	General Aircraft Manual
GAFIPB*	German Air Force Illustrated Parts Breakdown
GAPL	Group Assembly Parts List
GATF	Graphic Arts Technical Foundation
GCT	General Classification Test (Navy)
GFAE	Government Furnished Aeronautical Equipment
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GFM	Government Furnished Material
GFP	Government Furnished Property
GFP	Government Furnished Publication(s)
GL	Grade Level
GM DRM*	General Motors Diagnosis & Repair Manual
GMRMR	General Mobilization Reserve Material Requirement
GOCO	Government Owned, Contractor Operated
GOM	Graphic Operations Manual
GOR	General Operational Requirements

GPAM*	Graphically Proceduralized Aids for Maintenance
GPO	Government Printing Office
GS	General Support
GS	General System
GSA	General Services Administration
GSM*	General System Manual
GV	General Vehicle
GVM*	General Vehicle Manual

H

HAWK RM SCM*	Hawk Radar Mechanic Symptom Collection Manual
HDR	Hardware
HE	Human Engineering
HEATHKIT*	(Title Unknown)
HFE	Human Factors Engineering
HFI*	Haydon Fault Indicator
HJPA*	*Hybrid Job Performance Aid*
HMA*	Hybrid Maintenance Aid
HOLDOR IS*	Holographic Laser Document Retrieval System
HOLO*	*Holography*
HQ	Headquarters
HRMR	Human Readable Machine Readable
HTA*	Hybrid Troubleshooting Aid

I

IA*	Interpretive Aids
IAC	Integrating Associate Contractor
IBM	Intermediate Ballistic Missile
IBT*	Integrated Blocked Text
ICBM	Intercontinental Ballistic Missile
ICD	Interface Control Drawing
ICP	Inventory Control Point
ICS	Interim Contractor Support
ICWG	Interface Control Working Group
ID	Identification
ID	Initial Distribution
IDMIS	Interservice Depot Maintenance Interrogation System
IDMTG	Interservice Depot Maintenance Task Group
IET*	Imagery Enhancing Technique
IF	Intermediate Field

IFB	Invitation For Bid
ILLUSTROMAT*	*Illustromat 1100*
ILO	Interservice Liaison Officer
ILS	Integrated Logistics Support
ILSD	Integrated Logistics Support Detachment
ILSDITS*	ILS Digitized Information Transfer System
ILSMT	Integrated Logistics Support Management Team
ILSO	Integrated Logistics Support Office
ILSP	Integrated Logistics Support Program
ILT	Installation Leadtime
ILTM*	Incidental Learning of Troubleshooting Methodology
IM	Item Manager
IMC	Item Management Coding
IMC*	Integrated Maintenance Concept
IMC*	Integrated Maintenance Chart
IMM*	Integrated Maintenance Manual
IMP*	Integrated Maintenance Package (*or* Plan)
IMPLODE*	Implosion Technique
INSP	Inspection
INSTL	Installation
INT FH	Interval Per Flight Hour
INTMD	Intermediate
IOSD	*Initial Operational Support* Date
IPA	Industrial Property Account
IPB	Illustrated Parts Breakdown
IPD	Issue Priority Designator
IPR	In Process Review
IPV	Intensified Product Verification
I&R	Inspect and Repair
IRDS*	Information Retrieval and Display System
ISD	Instructional Systems Development
ISMIS	Interservice Maintenance Integration System
ISP	Integrated Support Plan
ISRWL	Interchangeability, Substitutability, and Replaceability Working List
IT*	Integrated Test
ITDT*	Integrated Technical Documentation and Training
ITIES	Interservice Technical Information Exchange System
ITOFCN	Interim Technical Order Field Change Notice
ITP	Integrated Test Plan
ITPS	Identifying Technical Publication Sheet
IWSM	Integrated Weapon Support Management

J

JAAA*	Job Aid Assessment Algorithm
JAN	Joint Army-Navy Standard
JCC	Joint Configuration Conference
JCP	Joint Committee On Printing
JCS	Joint Chiefs of Staff
JETDS	Joint Electronics Type Designator System
JG	Job Guide
JGM*	Job Guide Manual
JGRA*	Job Guide Repair Aids
JGTA*	Job Guide Troubleshooting Aids
JGTOS*	Job Guide Technical Order System
JLC	Joint Logistics Commanders
JNWP	Joint Nuclear Weapons Publication
JOA	Joint Operating Agreement
JOB GUIDES*	Job Guide Formats
JOBTRAIN*	(Title Unknown)
JOP	Joint Operating Procedures
JPA*	Job Performance Aid
JPG*	Job Performance Guide
JPM*	Job Performance Manual
JPSG	Joint Planning and Scheduling Group
JSI	Joint Support Item
JSL	Joint Support List
JTG*	Job Task Guide
JTM*	Job Task Manual

K

KINTEL*	Kintel Closed Circuit TV
KLD	Kit Letter Designator
KOM	Kind of Match

L

LC	Lubrication Chart
LCC	Life Cycle Cost
LCI*	Learner-Centered Instruction
LDM	Local Digital Message Exchange
LGC	Logistics Guidance Conference
LGCP*	Lexical-Graphic Composer-Printer
LM	Logistics Manager
LOAP	List of Applicable Publications

LOR	Level of Repair
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record
LSMHT	List of Standard/Modified Hand Tools
LSP	Logistics Support Plan
LSPC	Logistics System Policy Committee
LSPPS	Logistics Support Plan for Preoperational Support
LT*	Logic Tree
LTL/LCL	Less Than Truckload/Less Than Carload
LTS-1/LTS-2*	Lincoln Training System
LTTA*	Logic Tree Troubleshooting Aids

M

M3DD*	Microfilmed Maintenance Manual Data Dissemination
MA	Maintainability Analysis
MA	Maintenance Action
MAC	Maintenance Allocation Chart
MAC	Military Airlift Command (USAF)
MADAR/GPS*	Malfunction Detection Analysis & Recording (w/Ground Processing System)
MA/FH	Maintenance Action per Flight Hour
MAGNACARD*	(Title Unknown)
MAGNAVUE*	(Title Unknown)
MAINT	Maintenance
MA/INT	Maintenance Action Interval
MAINTRAIN*	Maintenance & Training in Complex Systems
MAJCMD	Major Command
MAJCOM	Major Command
MAOT	Maximum Allowable Operating Time
MAP	Mutual Assistance Program
MARISAT	Maritime Mobile Satellite Communication System
MC	Management Code
MCN	Master Control Number
MCP	Military Construction Program
MCSL	Management Control System List
MDC	Maintenance Dependency Chart
MDCS	Maintenance Data Collection System
MDN	Manufacturers Drawing Number
MDS*	Maintenance Data System
MDS	Mission Design and Series
MEA	Maintenance Engineering Analysis
MEC	Military Essentiality Code

MECH	Mechanical
MEDIA*	Magnavox Electric Data Image Apparatus
MEMRI*	Maintenance Engineering Management & Repair Information
MGFEL	Master Government-Furnished Equipment List
MH/FH	Man Hours per Flying (*or* Flight) Hour
MIC	Match Indicator Code
MIARS*	Maintenance Information Automated Retrieval System
MICOM	Missile Command
MICRO-III*	Micro-III Portable Viewer
MICROCARD*	(Title Unknown)
MICROMS*	Maintenance Information Concerning Repair & Operation of Missile Systems
MICROVUE*	(Title Unknown)
MIDAS	Maintenance Integrated Data Access System (USAF)
MIL	Military
MILSPEC	Military Specification
MILSTAMP	Military Standard Transportation and Movement Procedures
MILSTD	Military Standard
MILSTRIP	Military Standard Requisition & Issue Procedures
MIM*	Multi Image Microfilm
MINICARD*	Minicard System
MINIDATA*	(Title Unknown)
MINIMIC*	Miniature Microviewers
MIP	Maintenance Index Pages
MIP	Material Improvement Project
MIPN	Maintenance Item Part Number
MIPR	Military Interdepartmental Procurement Request
MIRACODE*	Miracode System
MIRAID*	(Title Unknown)
MIRM*	Maintenance Instruction Recorded Magnetically
MIRR	Material Inspection and Receiving Reports
MIS	Management Information System
MISG	Maintenance Interservice Support Group
MISMO	Maintenance Interservice Support Management Office
MISO	Maintenance Interservice Support Office
MITIPAC*	(Title Unknown)
MLCC	Missile Launch Control Center
MLF	Maintenance Level Function
MLF	Missile Launch Facility
M/M	Man Machine (Interface)
MMC	Maintenance Management Center
MMH	Maintenance Man Hours
MMM	Maintenance Manpower Modeling
MMS*	Maintenance Management System

MNL	Manual
MOE	Measure(s) of Effectiveness
MOM*	Maintenance on Microfilm
MODE*	Maintenance Operations Documentation Enhancement
MOS	Military Occupational Specialty (Army)
MOTD	Maintenance and Operating Technical Data
MPC	Materiel Program Code
MPL	Maintenance Parts List
MPTO	Methods and Procedures Technical Order
M&R	Maintainability and Reliability
MRB	Material Review Board
MRC*	Maintenance Requirement Card
MRS/SRM*	Malfunction Reporting System/Specific Repair Methods
MS	Military Specification
MS	Military Standard
MSE	Maintenance Support Equipment
MSI	Military Service Indicator
MSI	Military Standard Item
MSIM*	Maintenance Support Information Manual
MSLS	Missiles
MT*	Maintenance Tips
MTA	Maintenance Task Analysis
MTBCA	Mean Time Between Corrective Actions
MTBD	Mean Time Between Demand
MTBF	Mean Time Between Failures
MTBM	Mean Time Between Maintenance
MTBMA	Mean Time Between Maintenance Actions
MTN	Motion
MTS	Maintenance Trainer Set
MT/SC	Magnetic Tape Selectric Composer
MT/ST	Magnetic Tape Selectric Typewriter
MTTR	Mean Time to Repair
MTU	Mobile Training Unit

N

NAMES*	Navy Aircraft Maintenance Evaluation System
NAMP	Naval Aviation Maintenance Program
NARF	Naval Air Rework Facility
NAS	National Aircraft Standard
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NATOPS	Naval Air Training and Operator Procedures Standardization

NATSF	Naval Air Technical Services Facility
NAVAIR	Naval Air Systems Command
NAVCOMPARS	Naval Communication Processing and Routing Systems
NAVELEX	Naval Electronics Systems Command
NAVFAC	Naval Facilities Command
NAVMACS	Naval Modular Automated Communications Systems
NAVMAT	Naval Materiel Command
NAVMATINST	Naval Materiel Command Instruction
NAVPRO	Naval Plant Representative Office
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NBS	National Bureau of Standards
NC	Numerical Control
NC *or* N.C.	Noncatalogued
NDCP	Navy Decision Coordinating Paper
NDT	Nondestructive Testing
NEC	Navy Enlisted Classification
NEOCS	Navy Enlisted Occupational Classification System
NEOS*	Neostylized Manuals
NHA	Next Higher Assembly
NHB	NASA Handbook
NH&S	Nuclear Hardness and Survivability
NICORD*	(Title Unknown)
NIIN	National Item Identification Number
NI&RT	Numerical Index and Requirement Table
NKT*	Number-Keyed Text
NLA	Next Lower Assembly
NMA	National Micrographics Association
NMC	Naval Materiel Command
NMFC	National Motor Freight Classification
NOC	Not Otherwise Coded
NOR	Notice of Revision
NORS	Not Operationally Ready - Supply
NOTAP	Navy Occupational Task Analysis Program
NPD	Navy Procurement Directive
NPFC	Navy Publications and Forms Center
NPPSBO	Naval Publications and Printing Services Branch Office
NPPSMO	Naval Publications and Printing Services Management Office
NPPSO	Naval Publications and Printing Services Office
NPRDC	Navy Personnel Research and Development Center
NRL	Naval Research Laboratory
NSA	National Security Agency
NSDSA	Naval Sea Data Support Activity

NSF	National Science Foundation
NSN	National Stock Number
NSWSES	Naval Ship Weapon Systems Engineering Station
NTIP	Navy Technical Information Program
NTIPP	Navy Technical Information Presentation Program
NTIPS*	Navy Technical Information Presentation System
NTIS	National Technical Information Service
NTMMO	Navy Technical Manual Management Organization
NTMS*	Navy Technical Manual System
NTS	Nontroubleshooting
NWC	Naval Weapons Center

O

OASD	Office of the Assistant Secretary of Defense
OC-ALC	Oklahoma City Air Logistics Center
OCAMA	Oklahoma City Air Materiel Area
OCC	Operations Control Center
OCL	Operational Control Level
OCO	Operational Capability Objective
OCR	Optical Character Recognition
OD	Overhaul Depot
OJT	On-the-Job Training
OMB	Office of Management and Budget
OMMS*	Organizational Maintenance Manual Set
O&MN	Operation and Maintenance, Navy (funding)
OP	Operator
OPALT	Operational Alteration
OPN	Operation(s)
OPNAV	Office of the Chief of Naval Operations
OPR	Office of Primary Responsibility
OPTICS*	Optimum Procedure Task Instruction Compiler
OP/WF*	Optimum Picture/Word Format
OQE	Objective Quality Evidence
ORDALT	Ordnance Alteration
ORDLIS	Ordnance Logistics Information System
ORLA	Optimum Repair Level Analysis
ORTS*	Operational Readiness Test System
OSD	Office of the Secretary of Defense
OSE	Operating Support Equipment
OTA	Operator Task Analysis
OTE *or* OT&E	Operational Test and Evaluation
OVHL	Overhaul

P

PABD*	Precise Access Block Diagram
PCA	Physical Configuration Audit
PCC	Provisioning Control Code
PCI	Product Configuration Identification
PCO	Procuring Contracting Officer
PCR	Periodic Command Review
PCR	Publication Change Request
PDM	Periodic Depot Maintenance
PDR	Preliminary Design Review
PDR	Preliminary Documentation Review (Navy)
PE	Procedures Evaluation
PERT	Program Evaluation Review Technique
PFC*	Procedures Flow Chart
PGFEL	Preliminary Government-Furnished Equipment List
PHST	Packaging, Handling, Storage, and Transportability
PIA	*Printing Industries of America*
PII	Procurement Instrument Identification
PIMO*	Presentation of Information for Maintenance and Operations
PIP*	Programmed Individual Presentations
PLP*	Pulsed Light Projection
PLT	Procurement Leadtime
PLT	Production Leadtime
PM	*Program (or Project)* Manager
PMAC	Preliminary Maintenance Allocation Chart
PMC	Procurement Method Code
PMEL	Precision Measurement Equipment Laboratory
PMO	Program (*or* Project) Management Office
PMRT	Program Management Responsibility Transfer
PMS	Planned Maintenance System
P/N	Part Number
PNCIA	Part Number of Component Item Affected
PO	Project (*or* Program) Office
PO	Purchasing Office
POMO	Production Oriented Maintenance Organization
POST	Production Oriented Scheduling Techniques
POSD	Preoperational Support Date
POSP	Preoperational Support Program
PPB	Provisioning Parts Breakdown
PPL	Provisioning Parts List
PPS	Percent Personal Sentences
PPT	Punched Paper Tape

PQA	Procurement Quality Assurance
PQS	Personnel Qualifications Standard (Navy)
PR	Procedures Review
PR	Purchase (*or* Procurement) Request
PRAM	Programmable Random Access Memory
PRI	Personnel Requirements Information
PRMIS	Printing Resources and Management Information System
PR/O	Pilot Rework Overhaul
PROC	Procedure(s)
PROFILE*	Profile Cards
PR/R	Pilot Rework Repair
PS*	PS Magazine
PSE	*Peculiar Support Equipment*
PSEL	Priced Support Equipment List
PSF	Primary Support Facility
PT	Penetrant
PTIM	Preliminary Task Identification Matrix
PTO	Preliminary Technical Orders
PVI	Product Verification Inspection
PVTO	Partially Verified Technical Order
PWR	Power
PWRR	Pre-positioned War Reserve Requirement
PYRAGRAM*	Pyramid Diagrams

Q

QA	Quality Assurance
QALI	Quality Assurance Letter of Instruction
QAR	Quality Assurance Representative
QC	Quality Control
QDE	Quality Data Evaluation
QPL	Qualified Product List
QQPRI	Qualitative and Quantitative Personnel Requirements Information
QRC	Quick *Reaction Capability*
QRTMMS	Quick Reaction Technical Manual Modification System
QUIX*	Quick Fix

R

RA	Requiring Activity
RAC	Rapid Action Change
RAL	Required Average Life
RAPID*	Radio and Press Information Dissemination

RAPIDS*	Rapid Automated Problem Identification Data Systems
RCS	Reports Control Symbol
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
RE	Reading Ease
REPOM*	Reliability Prediction Oriented Maintenance
REQTS	Requirements
RESTORE*	Rapid Evaluation System to Repair Equipment
RFB	Request for Bid
RFP	Request for Proposal
RFQ	Request for Quotation
RGL	Reading Grade Level
RIDE	Reading Impact Difficulty Estimate
RILSA	Resident Integrated Logistics Support Activity
RIW	Reliability Improvement Warranty
RLA	Repair Level Analysis
RNCC	Reference Number Category Code
RO	Requirements Objective
ROC	Required Operational Capability
RP	Real Property
RPIE	Real Property Installed Equipment
RPO	Repair Parts Order
RPPP	Repair Parts Program Plan
RPV	Reduced Product Verification
RPV	Remotely Piloted Vehicle
RRPL	Recommended Repair Parts List
RRPO	Recommended Repair Parts Order
RSS	Requirement Spread Sheet
RT	Radiographic
RTAT	Rework Turnaround Time
RTE	Resident Training Equipment

S

SAC	Strategic Air Command
SADIE*	Smith's Aural Diagnostic Inspection Equipment
SAMSO	Space and Missile Systems Organization
SAP	System Acquisition Process
SAP	Security Assistance Program
SBD*	Schematic Block Diagrams
SC	Sequence Chart
SCAS	Standard Configuration Accounting System
SCC	System Control Code

SCN	Specification Change Notice
SCP/DLT*	Symptom-Cause Prompts/Decision Logic Tables
SCP/SPT*	Symptom-Cause Prompts/Symptom Pattern Tables
SD	Space Division
SDLM	Standard Depot Level Maintenance
SDM*	Schematic Diagram Manual
SDR	System Design Review
SDT	Second Destination Transportation
SE	Support Equipment
SECAS	Ship Equipment Configuration Accounting System
SECNAV	Secretary of the Navy
SECNAVINST	Secretary of the Navy, Instruction
SEDS	System Effectiveness Data System
SEDSDR	Support Equipment Delivery Schedule/Delinquency Report
SEEI	Support Equipment End Item
SEI	Support Equipment Illustration
SEID	Support Equipment Installation Data
SEEIFR	Support Equipment End Item Funding Report
SEL	Support Equipment List
SEMP	Systems Engineering Management Plan
SENSAID*	(Title Unknown)
SEP	Support Equipment Plan
SERD	Support Equipment Recommendation Data
SFTOA	Systems and Feasibility Tradeoff Analysis
SHAP	Ship Acquisition Plan
SHAPM	Ship Acquisition Project Manager
SHIPPALT	Ship Alteration
SHOCK ACTION*	(Title Unknown)
SICR	Selected Item Configuration Record
SICR	Supply Item Change Record
SIMM*	Symbolic Integrated Maintenance Manual
SIMS*	Symbolic Integrated Maintenance System
SIN	Service Identification Number
SIR	Special Inspection Requirement
SISMS	Standard Integrated Support Management System
SM	Support Manager
SM/IM	System Manager/Item Manager
SML	Support Material List
SMMD	Simplified Maintenance Manual Design
SMR	Source, Maintenance, and Recoverability
SMS	Surface Missile System
SMSB	Strategic Missile Support Base
SOM	Simplified Operations Manual

SORTS	Shipboard Organizational Troubleshooting System
SOW	Statement of Work
SPA*	Skill Performance Aids
SPA	Specification Preparing Activity
SPARTECS	Spares Test Capability Report
SPEC	Specification
SPM	System Project Manager
SPMO	System Project Management Office
SPO	System Program Office
SPR	Special Program Requirement
SRA	Shop Replaceable Assembly
SRA	System Requirements Analysis
SRPPP	Spares and Repair Parts Program Plan
SRU	Shop Replaceable Unit
SS	Safety Supplement
SSE	Standard Support Equipment
SSR	Supply Support Request
STANAG	Standard Agreement
STD	Standard
STD	System Test Directive
STE	Special Test Equipment
STDMIS	Ships Technical Data Management Information System
STPS	Ships Technical Publications System
STOP	Sequential Thematic Organization of Publications
STRU	Structure
SUBSAFE	Submarine Safe
SWP	Subordinate Work Package
SYSCOM	Systems Command (Navy)

T

TA	Technical Analysis
TAC	Tactical Air Command
TACFIRE	Tactical Fire Direction System
TACSAT	Tactical Satellite
TAEG	Training Analysis and Evaluation Group (Navy)
TAFI	Turn Around Fault Isolation
TAG	The Adjutant General
TAMMS	The Army Maintenance Management System
TASKTEAMII	(Title Unknown)
TBO	Time Between Overhaul
TCC	Type of Change Code
TCD	Time Compliance Directive

TCI	Time Change Item
TCN	Transportation Control Number
TCTI	Time Compliance Technical Instruction
TCTO	Time Compliance Technical Order
TDDD*	3-D Dynamic Display
TDI	Technical Document Index
TDP	Technical Development Plan
TDR	Teardown Deficiency Report
TEAMAN*	Teaching Manuals
TEAMS*	(Title Unknown)
TEC	Training Extension Course
TI	Technical Interchange
TIF	Technical Information Field
TIM	Task Identification Matrix
TIP	Technical Information Presentation
TLR	Top Level Requirement(s)
TLS	Top Level Specification(s)
TM	Technical Manual
TMCR	Technical Manual Contract Requirement
TMDER	Technical Manual Deficiency Evaluation Report
TMINS	Technical Manual Identification Numbering System
TMIP	Technical Manual Improvement Program
TMIS*	Technician's Maintenance Information System
TMM	Technical Manual Manager
TMMP*	Technical Manual Microform Program
TMMPC	Technical Manual Management Program Council (Navy)
TMMT	Technical Manual Management Team
TMP	Technical Manual Plan
TMSR	Technical Manual Ship Requirement
TMSS	Technical Manual Specifications and Standards
TO	Technical Order
TOC	Technical Order Compliance
TOCN	Technical Order Change Notice
TOCRL	Technical Order Code Requirements Listing
TOCU	Technical Order Control Unit
TODA	Technical Order Distribution Account
TODCA	Technical Order Distribution Control Activity
TODO	Technical Order Distribution Office
TODS	Technical Order Distribution Subaccount
TODS	Technical Order Distribution System
TOFCN	Technical Order Field Change Notice
TOIRS	Technical Order Improvement Reporting System (Navy)

TOMA	Technical Order Management Agency
TOMIS	Technical Order Management Information System
TOMS*	Technical Order Microfilm System
TOPP*	Task-Oriented Plant Practices
TOPP	Technical Order Publication Plan
TOPS	Technical Order Page Supplement
TORB	Technical Order Review Board
TORC	Technical Order Receiving Code
TOREG	Technical Order Review Evaluation Guide
TOSB	Technical Order Standardization Board
TOT	Task-Oriented Training
TPA	Test Planning Analysis
TR	Technical Report
T/R	Troubleshooting/Repair
TRACE*	Transistor Radio Automatic Circuit Evaluator
TRADOC	Training and Doctrine Command (Army)
TRC	Technology Repair Center
TROLO*	Trouble Locators
TRUMP*	Technical Review and Update of Manuals and Publications
TS	Troubleshooting
TSC*	Troubleshooting Chart
TSE	Test Support Equipment
TSG*	Troubleshooting Guide
TSM*	Troubleshooting Manual
TSMC	Technical Supply Management Code
TSP*	(Title Unknown)
TT*	Team Training
T/TM	Training Technical Manual (tradeoff)

U

UDM	User Data Match
UFC	Uniform Freight Classification
U/M	Unit of Measure
UMMIPS	Uniform Materiel Movement and Issue Priority System
UND	Urgency of Need Designator
UPIINS	Uniform Procurement Instrument Identification Numbering System
UR	Unsatisfactory Report
US	United States
USDA	United States Department of Agriculture
USAF	United States Air Force
USAMC	United States Army Materiel Command

USAMMC	United States Army Maintenance Management Center
USANDL	United States Army Nuclear Defense Laboratories
USIPB*	United States Illustrated Parts Breakdown
USMC	United States Marine Corps
USN	United States Navy
UT	Ultrasonic
UUT	Unit Under Test

V

VAFB	Vandenberg Air Force Base
VAST*	Versatile Avionics Systems Test
VATE*	Versatile Automatic Test Equipment
VDT	Visual Display Terminal
VE	Value Engineering
VECP	Value Engineering Change Proposals
VIDEOFILE*	Videofile System
VIDEOSONIC*	Videosonic System
VIS*	Visual Information System
VTM	Verification Team Manager
V V	Validation and Verification

W

WALNUT*	(Title Unknown)
WBS	Work Breakdown Structure
WC	Work Card
WDM*	Wiring Diagrams Manual
WISSA	Wholesale Interservice Supply Support Agreement
WORKPAC*	Work Package Concept
WS	Weapon System
WS	Work Sheet
WSAP	Weapons System Acquisition Process
WSMAC*	Weapon System Maintenance Action Center
WUC	Work Unit Code

X

XFL*	Experimental Fault Locator

SECTION 3. DEVELOPMENTS IN PROCEDURAL DATA FORMATS

3.1 SYSTEM OPERATION AND MAINTENANCE PROBLEMS

3.1.1 BACKGROUND. Advances in weapon systems technology since the days before World War II have been a mixed blessing for the military services. Inventive engineers have succeeded in providing the Armed Forces with weapons capabilities undreamed of in those early years. The demands of a nation at war in the early forties rapidly escalated the quantities and types of weapons and support systems, a process which continues today. The U.S. military services, and especially the Air Force, now have more weapons and support systems that will do more, and do it better and faster. With these increased capabilities, however, have come much-increased complexity and cost.

The traditional response to the growing sophistication of the hardware system has been to increase the amount of training given to both users and maintainers of the equipment. As a result, the costs of training have gone up rapidly (while at the same time training budgets have been decreasing), with a much greater proportion of a maintenance technician's tour of duty spent in training, and a smaller proportion spent in the performance of productive work. Greater numbers of highly trained specialists were required for the maintenance and repair of sophisticated equipment, with many more technicians required to compensate, in part, for the length of time spent in the training pipeline.

Superimposed on this situation, several other trends have become noticeable. To what extent they are causes or effects has not been determined with any certainty, but they are further compounding the increasing unavailability of trained technicians. For instance, the skill levels of first year enlistment personnel have been decreasing at a significant rate. At the other end, more and more technicians are leaving military service at, or even prior to, the end of their first enlistment. Even the experienced, highly skilled technicians have been leaving the service at an earlier stage in their careers than in past decades. The consequences of this series of events have been increased cost and personnel turbulence, and indications of decreased material readiness.

3.1.2 POTENTIAL SOLUTIONS. Obviously, no single occurrence, event, or policy is responsible for the problem outlined here, nor will any single solution turn it around. Various approaches are being investigated and tried: training programs are being revised to both shorten the amount of time spent in training and focus on job oriented training to promote earlier productivity (*Ref. 52*). The U.S. Navy has initiated a program that postpones extensive front-end training until it has been determined that an individual technician is a good career force candidate with a high potential for success (*Refs. 86, 87*).

Many different approaches are being investigated within the Air Force to improve maintenance readiness. One such program, known as POMO and POST, is in use by the Tactical Air Command (TAC) and involves a revamped maintenance structure that differs from the AFR 66-1 "Maintenance Management" organization (*Ref. 83*). Integral to these concepts is the increased personal identification between the maintenance crew and a particular aircraft, reminiscent, to some extent, of the maintenance crews of World War II operations.

3.1.3 **TECHNICAL INFORMATION IMPROVEMENT.** A factor common to these approaches is the recognition that improvements must be made in the quality and usability of technical documentation. Traditional technical manuals have focused for years on theory of operation and system descriptive type of information, relying on highly skilled technicians to determine what needed to be done and how to accomplish it. The Air Force was a leader in investigating innovative ways to transmit technical information to maintenance personnel in ways that would increase productivity and error-free performance; that is, it sponsored increased investment in the "book" (TOs) rather than in the "head" (*training and* experience). This goal is a part of official DOD and Hq. USAF policy, as can be seen from the following excerpted statements:

> Air Force Policy . . .
>
> The management of the TO system includes exploring and adopting promising new techniques and technology for technical data format and presentation; determining TO requirements, material content, and distribution procedures; and printing and funding.
>
> *AFR 8-2, Air Force Technical Order System*

> Section B Policy
>
> *New Methods for Technical Publications.*
> In the early stages of the program, the SPO should consider new techniques for presentation of maintenance and operations information. *He will review such new techniques* for application to his program as a supplement or replacement of existing publications.
>
> *AFSCM 310-2, Technical Publications Acquisition Manual*

3.2 INNOVATIVE FORMAT RESEARCH AND DEVELOPMENT

Most of the research which is discussed in this guide, and the particular techniques that the TO Manager must consider for use in Air Force programs, are generally referred to as "Job Performance Aids," or "JPAs." Similarly, many of the techniques are designated as "formats," including all of those that are recommended for consideration (AFHRL-TR-80-50, Sections 4 and 5). Although most people in fields related to TOs and TMs have a general idea of what is meant by "JPA" and "format," a clear understanding of these concepts is necessary. It is appropriate, then, to resolve any remaining ambiguities before proceeding further.

3.2.1 **THE MEANING OF "JOB PERFORMANCE AIDS (JPAs)."** In a recent survey of JPA state-of-the-art (*Ref. 1*), the evolution of the term "job performance aid" is reviewed, and various definitions are provided. In its earliest form, a "job aid" was defined as "an item whose purpose is the support of performances by system personnel, which are necessary for overall system performance." Somewhat later, the usage which is probably most familiar to TO Specialists emerged, defining a "job performance aid" as "documents or devices that give precise, step-by-step instructions for each task, or otherwise present in a concise or consolidated manner all information relevant to the task" (*Ref. 17*). Many other definitions and uses have been offered. The author of the survey report (*Ref. 1*) proposed the following explanation as best describing the past *and*

present meaning of "job performance aids." (This is the meaning adopted for use in this Handbook.) "A job performance aid is any device, *manual, guide*, or tool used on the job to facilitate performance or to avoid costs where learning from the aid is incidental."

Such aids can vary from a simple metric conversion card to a complex troubleshooting logic network diagram used in electronic fault isolation. Other examples are a pilot's preflight checklist, a hand-held computer, a job guide manual, or even diagnostic and test equipment used on the job, whether built-in or peripheral. Although this definition is very broad, it does limit the term to techniques used *on the job* and in which learning what to do and how to do it is *incidental* to the use of the aid.

The literature on JPAs documents many different approaches, methods, techniques, and devices, a sampling of which is contained in Section 4. While many of these candidates are within the bounds of the above definitions of a JPA, many are not, since they are more concerned with training of personnel or with the production/delivery of technical instructions than with on-the-job assistance. Within the population of legitimate JPA candidates, several descriptors of JPAs are recognized (*Refs. 9, 1, 93*) which segregate the techniques according to the characteristics they possess. These descriptors are: format, media, delivery, diagnosis, and training. A particular JPA can have important characteristics of all of these; it cannot, however, be limited to training and or delivery alone and still be considered a JPA. In this guide, only JPAs which have significant "format" characteristics were selected for consideration.

3.2.2 THE MEANING OF "FORMAT." The word "format" has been associated with technical publications in general, and JPAs in particular, for so long that is a familiar term. Unfortunately, there is little common understanding of *what the term means*. Military specification MIL-M-38784A (*Manuals, Technical: General Style and Format Requirements*), in use by all the Armed Forces, prescribes requirements, but does not define the term. Neither does AFM 11-1 (*U.S. Air Force Glossary of Standardized Terms*). Even a dictionary definition of the word does little more than provide a context for its use:

(1) the shape, size, and general makeup of a publication.

(2) a general plan of organization or arrangement.*

These definitions are not inaccurate, they are merely inadequate, especially when applied to JPAs. Researchers in the field of JPAs have been similarly remiss, to the extent of describing JPAs as *being of a certain* "format" without defining that format. In order that this guide may not suffer from the same deficiency, "format" is defined as: *The organization, arrangement, and level of specificity of the informational content of operations and maintenance instructions.*

Note that "informational content" is the operative phrase. A particular format, then, remains the same whether it appears on a printed page, on a *video display*, or is spoken.

3.2.3 EARLY INTEREST IN IMPROVED PROCEDURE FORMATS. Most reviews and surveys of research efforts related to improvements in procedural data trace the beginnings of such efforts to the decade following World War II. This implies that technical manuals of earlier years were little

Webster's Seventh New Collegiate Dictionary, G&C Merriam Co., 1969.

more than narrative descriptions with pictures, and that little thought or consideration was given to the needs of the users. Although such an appraisal has some merit, the fact remains that changes and innovations in the approach to preparing technical manuals were constantly occurring before the post-war "renaissance." Before that time, specifications had already begun requiring the inclusion of certain kinds of information, and the general organization of the manuals was moving toward a standardized approach. Format related approaches, such as checklists, were being incorporated to an increasingly greater extent as technical writers perceived the need to formalize aids that field personnel had been developing themselves. It has been reported (*Ref. 16*) that one innovative technique, the Logic Tree Troubleshooting Aid (LTTA), was present in some manuals in use during World War II. LTTAs of the present are not greatly different from early versions (AFHRL-TR-80-50, Section 5). Nevertheless, training and on-the-job experience continued to be the basis for successful maintenance performance.

The research basis for such improvements as did occur prior to the late 1940s is obscure. It is apparent, however, that there was no general recognition of the inadequacies of manuals *then* in use, nor an appreciation of the needs of using personnel.

3.2.4 USER ORIENTED RESEARCH. During the mid-1950s, the Air Force Personnel and Training Research Center (AFPTRC) initiated studies and investigations directed toward improving manpower utilization and maintenance effectiveness by substituting improved *on-the-job* instructions for *prior* instructions. These early efforts were variously termed "behavioral guides" and "job aids" (*Ref. 88*).* Objectives of these investigations are best described as follows:

Potential Contributions of Job Aids (from *Ref. 88*)

Reducing training requirements. As already stated, one of the principal contributions which can be made by job aids is that of reducing reliance on slow and costly processes of training. Job aids can accomplish this by cutting down the amounts of information and the number of concepts which the prospective technician must master and retain, and by eliminating or simplifying some of the more difficult decision processes involved in maintenance tasks.

Improvement in personnel utilization. By reducing training time, improved job-aids can speed the flow of Air Force maintenance men to the job situation and increase the proportion of enlistment time during which a man is capable of making a useful contribution to Air Force maintenance operations. They can improve utilization of personnel at the lower levels of skill by expanding the range of required maintenance tasks that can be adequately performed by men who are relatively untrained and, in some cases, fairly low in aptitude. This increased capability to utilize technicians of limited aptitude and experience can, in turn, contribute to considerably more effective use of the relatively scarce skilled personnel, by permitting them to concentrate on more difficult job operations.

**Reference 88* includes an excellent reference list to early work in this field.

Increase in reliability of performance. It is commonly acknowledged that the retention of information and procedures learned in formal training courses is often quite low, particularly when the information and procedures are used only *infrequently* in a job situation. Thus, for many maintenance tasks, greater availability and use of good job aids as "behavioral guides" can materially increase the reliability and precision of performance on the part of even more highly trained and experienced technicians by eliminating errors caused by failure to remember to correct procedures and standards.

Today, more than 20 years later, these contributions are still largely "potential" rather than "actual." Progress toward implementation of these concepts has been made, however, and now rests on a much larger base of research, evaluation, and utilization experience.

The research and findings of the AFPTRC spawned a great deal of similar research in other Air Force laboratories and other military services. Most of this research focused on changing the forms in which technical information was presented to the user, e.g., increased use of illustrations, listing of procedures in step-by-step fashion, page layout, and matrix type charts. This concentration on "form" is the basis for the usage in this guide of the term "format," which provides a descriptor for the various approaches. Earlier, formats that were highly proceduralized, i.e., described or listed each step of a task, were called "Job Performance Aids" (JPAs). Later, almost any innovative approach to technical information format was considered a JPA. More recently, the term JPA has been applied to any method of assisting the maintenance technician (and in some cases, the equipment operator) in the performance of duties (*Refs. 1, 18, 58, & 110*).

3.3 FORMATS RESULTING FROM EARLY RESEARCH

This portion describes some of the more significant innovations resulting from the early years of JPA research. This discussion makes no attempt to encompass *all* of the proposed, alleged, and/or actual innovative techniques that (as is shown in Section 4) now number in the hundreds (many of which remain in the conceptual stage of development).

3.3.1 FORECAST. FORECAST is the code name given to an Army project involving Task Oriented Training (TOT), conducted by the Human Resources Research Organization (HumRRO) in the late 1950s and early 1960s. (According to some authorities, the acronym is derived from the names of the principal developers of the techniques involved.) Although FORECAST research rivals that of the AFPTRC "behavioral guides" for early interest in improved methods of technical information transfer, the technique was not widely known until the early 1960s.

FORECAST is a troubleshooting technique applicable to most types of electronic equipment, which is still in use to some extent today. The technique has two distinguishing features which deserve mention here. First, it represents one of the earliest attempts to have the troubleshooting process at least partially structured for most efficient fault isolation by experienced systems analysts and engineers. And, *second*, it introduces a "blocking" process to the technical information to aid in identification of parts which could be responsible for a particular malfunction.

The FORECAST concept features five basic elements: troubleshooting block diagram (TBD), technical story, waveform guide, blocked schematic diagram (BSD), and resistance chart. The

first two elements (TBD and technical story) are used in the first step of troubleshooting to localize the trouble to an area of about four blocks (about 5 percent of the system). The waveform guide is used in the second step to localize the trouble to a single BSD, and the resistance chart is used in the third step to test parts within a block in order to identify the bad one(s).

Figure 3-1 illustrates the TBD and BSD portions of the FORECAST technique, extracted in part from *Reference 11*. *The technique* has been tested extensively, with results which showed that technicians using FORECAST materials, when compared to technicians using conventional materials:

a. Achieved equivalent performance with considerably *reduced* training time;
b. Achieved better performance with less training time;
c. Achieved considerably improved performance with the same training time (*Ref. 58*).

For additional information on the FORECAST technique, see *References 11, 9, 58, 17, & 46*, including the references cited therein.

3.3.2 *PIMO* — PRESENTATION OF INFORMATION FOR MAINTENANCE AND OPERATIONS. PIMO is *the acronym for a concept developed by Serendipity*, Inc. (under contract to AFHRL), for the Air Force Systems Command, beginning in 1963. Although initiated by the Ballistic Systems Division of AFSC, the project benefited by the involvement of AFLC, who conducted the test program; of AFMAC, whose C-141A aircraft were the test vehicles; and of the Army, who provided some of the financial support for the later phases of the project. It was the most extensive effort that had been conducted *in* job aid research to that time.

PIMO built upon, and further defined, the behavioral guide concepts resulting from early R&D at *the AFPTRC (see paragraph 3.2.2)*. The initial thrust of the PIMO project was the development for the UH-1F helicopter of what were then called JPAs, but are now recognized as the forerunners of JOB GUIDES, *to assist the technician in normal maintenance* activity. It was recognized that in most systems, approximately 80-85 percent of maintenance man-hours were expended on tasks that were essentially simple *in nature (Ref. 82)*. The preferred methods of performing these tasks, which included inspection, service, *remove*/install, adjust, and calibrate, were amenable to definition in advance through systems analysis. The format selected was relatively simple but highly effective for presenting instructions to *perform* these functions, and enabled an individual with relatively little training or experience to efficiently *perform* both simple and complex maintenance tasks.

The PIMO format (illustrated in Figure 3-2) was designed to provide all relevant information for any given task on two facing pages of the manual. Fully proceduralized narrative instructions were always on *the left* and keyed *illustrations* were on the right in this "pocket-sized" manual. All the information relevant to a particular *maintenance* activity (e.g., Rudder Control System Maintenance) was packaged into one small book. Other features in PIMO specifications included fixed format and syntax, a preferred verb list, and a limited number of steps per page.

The PIMO project experienced a *problem* common to many format research and development programs. The format for routine *maintenance* tasks was less than optimum for troubleshooting/fault isolation tasks. Rather than *force the* format to fit, the PIMO project team adopted a troubleshooting format (SIMM) then *under* development for the Navy. In the PIMO application, simplified Maintenance Dependency Charts (MDCs) and supporting narrative information keyed to schematic diagrams were prepared. (SIMM *and MDCs are discussed in* Volume I.)

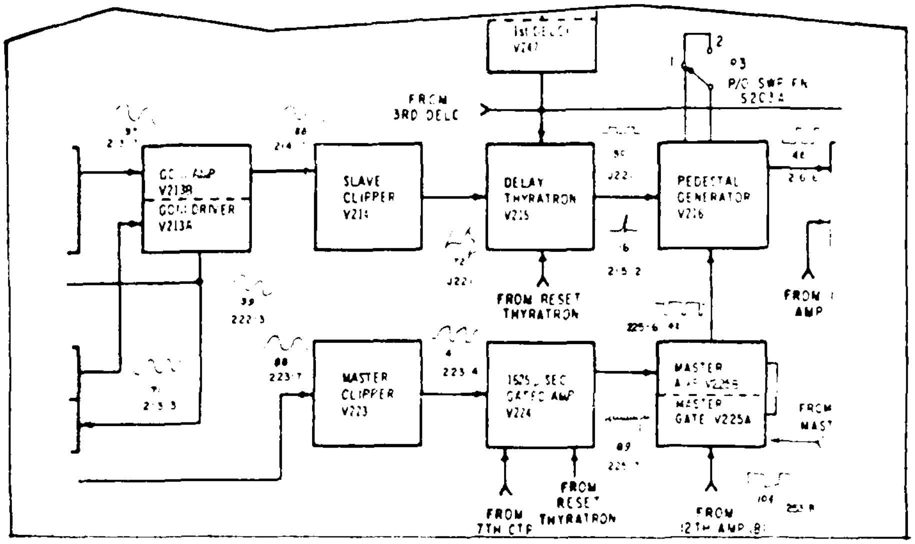

Figure 3-1 (a).–FORECAST Troubleshooting Block Diagram (Ref. 14)

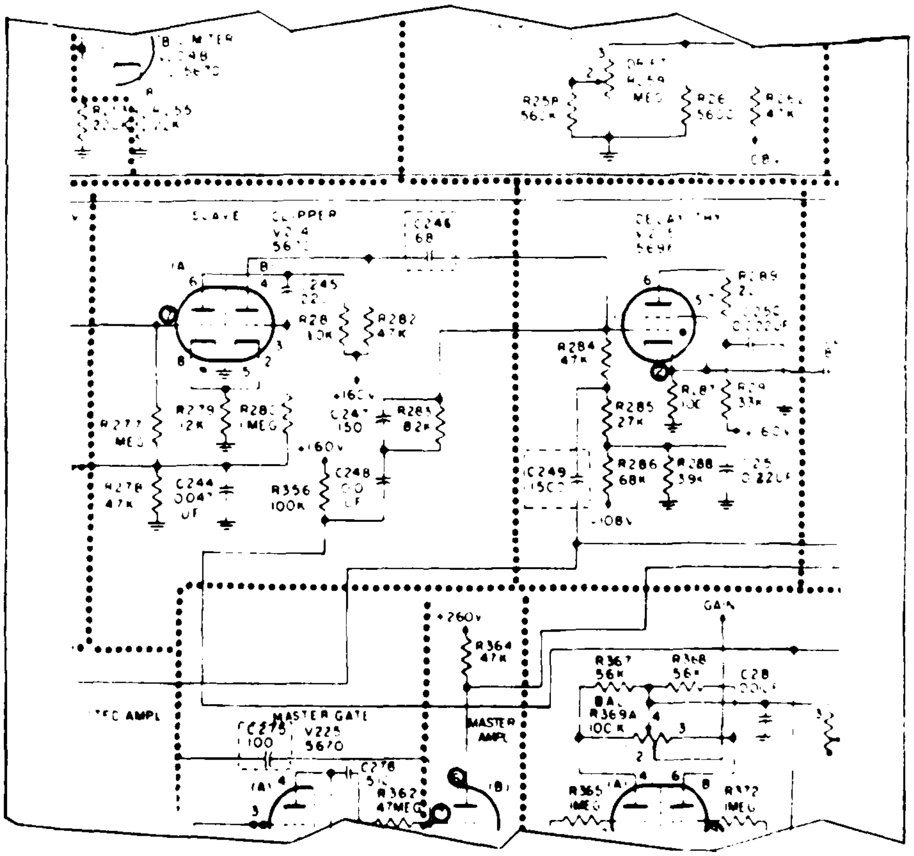

Figure 3-1 (b).–FORECAST Blocked Schematic Diagram (Ref. 14)

ADJUST RUDDER CONTROL SYSTEM AT RUDDER TRIM ACTUATOR

NOTE

Rig pin should be inserted into input quadrant during preparation for this activity. Rig pin will be later removed in this activity, then following tasks may be repeated.

1. Be sure rig pin is inserted in input quadrant assembly. If rig pin does not fit, turn quadrant by hand until rig pin fits.

2. Remove cotter pins from top and bottom of rudder trim actuator attach bolt. Remove nut, washers and bolt.

NOTE

If adjustment is required in following task, the rudder trim position indicator must be calibrated.

3. Try to re-insert bolt. If bolt does not fit, go to Frame 25. If bolt fits, install bolt, washers, and nut.

4. Install cotter pins on top and bottom of bolt.

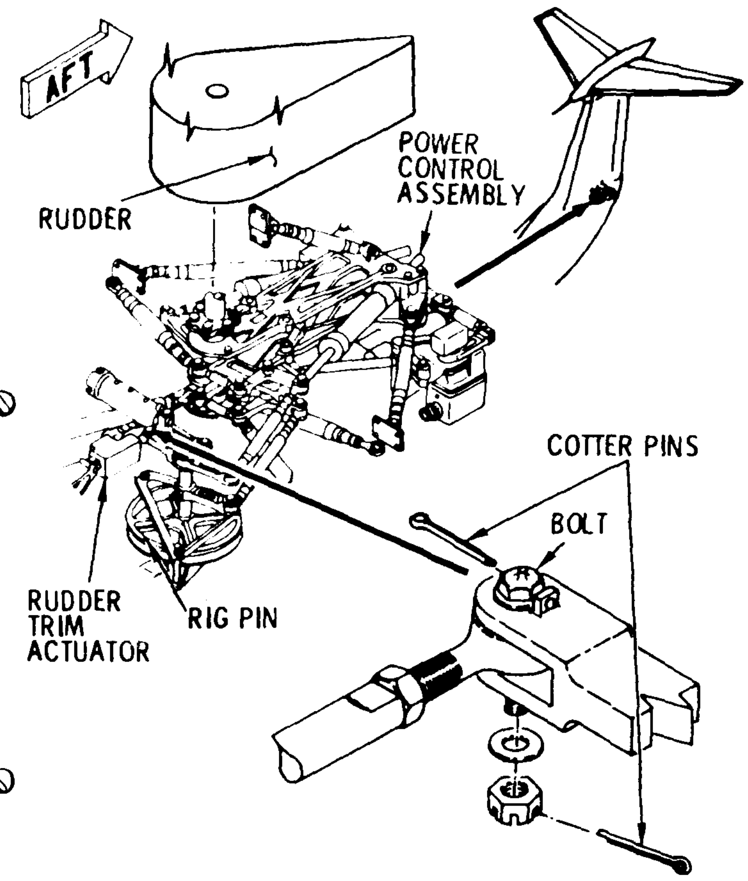

Figure 3-2.—PIMO Non-troubleshooting Maintenance Procedure Format (actual size) (Excerpt from PIMO Technical Manual, Organizational Maintenance Instructions, USAF Series C-141A Aircraft, Volume 50, 1 Jan. 1968 [changed 15 April 1968])

Test and evaluation of PIMO on the C-141 demonstrated the following advantages over conventional materials (*Refs. 17, 82*):

- It was compatible with either hard copy or audio-visual presentation.
- Task performance on non-troubleshooting (NTS) tasks by both experienced and inexperienced technicians was error-free.
- Inexperienced personnel performed complicated NTS maintenance tasks, error free, as quickly (or nearly so) as experienced technicians.
- Experienced personnel using PIMO troubleshooting procedures reduced performance time by 11 percent and maintenance errors by 92 percent.

The success of the PIMO concept on the C-141A stimulated further applications for the F-106 fighter aircraft, for UH-1H and CH-47 helicopters, and for C-123 and C-141 cargo aircraft for the Air Force, some in both English and Vietnamese. Outside of the Air Force, "PIMO manuals" were prepared for the Army PRC-25 radio system and several gun systems, and for tune-up and repair of Volkswagen automobiles (*Refs. 82, 60*). Also as a direct result of PIMO, a formal specification, MIL-J-83302 (USAF), was prepared to guide preparation of "Advanced JPAs" for the USAF. Furthermore, the JOB GUIDES required by MIL-M-38800A and MIL-M-83495 are a legacy of the PIMO project. JOB GUIDES are discussed in much greater detail in AFHRL-TR-80-50, Section 5.

For additional information on the PIMO technique see *References 6, 17, 60, 63, 66, 82, 90, & 91*. In addition, many of the reports on "JPAs" during the period 1964-1972 are based on PIMO.

3.3.3 *BAMAGAT* BLOCK-A-MATIC-A-GRAM-A-TEXT. This unusual acronym is the term, copyrighted by Hughes Aircraft Co., for an innovative approach to providing maintenance information. The definition provided above is that used in some of the earliest official documentation of the technique, and is derived from the use of BLOCKed scheMATICs, blocked diaGRAMS, and blocked TEXT (*Ref. 11*). However, another definition often used in the literature is "Blocked Assembly Maintenance and Group Assembly Troubleshooting."

Confusion surrounding this technique does not, unfortunately, end with the definition. Almost identical techniques began surfacing in the early 1960s with names such as Integrated Maintenance Concept (IMC), Integrated Maintenance Manual (IMM), Symbolic Integrated Maintenance System (SIMS), and Symbolic Integrated Maintenance Manual (SIMM). As SIMM, the concept became widely known and the subject of specification MIL-M-24100. More recently, with the publication of specification MIL-M-24100B, the technique has been "officially" designated as FOMM (Functionally Oriented Maintenance Manuals).

Since FOMM, the most recent successor to BAMAGAT, is discussed in detail in AFHRL-TR-80-50, this section will deal only with the early development and test activities of BAMAGAT/IMC/SIMS/IMM/SIMM.

The original BAMAGAT manuals were prepared for the Navy Bureau of Ships (BUSHIPS). BAMAGAT-inspired manuals were usually characterized by oversized (up to 35" x 15") pages, with diagrams utilizing various shadings of blue and gray, and were almost exclusively for electronic systems maintenance and troubleshooting. Whereas most other innovative techniques of the period were emphasizing increased proceduralization of task instructions, the BAMAGAT concept sought to improve the presentation of the functional relationship between various parts of a system.

Two basic techniques were used to accomplish this. The first, blocking, depicted functional and physical entities by the use of shading. This blocking technique was applied to functional diagrams, schematic diagrams, and text, with related diagrams in (upper and lower) facing page format. An excerpt of this type of presentation, from an early SIMM manual writer's guide, is presented in Figure 3-3. In the original, blue shading identifies function boundaries; the lighter the shade, the broader the function. Gray shading defines physical, or hardware, boundaries. Note that the respective boundaries are the same on each of the two facing pages.

The second basic technique that characterized BAMAGAT and its offspring was termed the *Integrated Maintenance Chart* (IMC) or Troubleshooting Chart (TSC). This technique is widely used today, and is now called a Maintenance Dependency Chart (MDC), discussed in *Volume I, Sections 4 and 7.*

BAMAGAT type manuals were certainly unique in appearance; they contained all the information included in a conventional manual, but in a graphic form that was somewhat easier to use and understand. This approach still left the decisionmaking responsibility with the technician. While tests showed (*Refs. 17, 18*) that performance improvement could be realized using this type of manual, the requirement for substantial technician training and experience was not reduced significantly.

Acceptance of the BAMAGAT inspired technique, first by BUSHIPS, later by the Coast Guard, and eventually by all the services to a limited degree, has been slow. Perhaps more than any other format-based technique discussed in this Handbook, serious disagreement exists regarding the strengths and weaknesses of the BAMAGAT-SIMM-FOMM concept. The unwieldy size, cost of production, and the training-experience factor have all had a role. Most critical appraisals address the more recent versions of the technique (SIMM-FOMM), rather than the relatively unknown early versions, and tend to reflect the point of view of the author's interest in, and experience with, FOMM type manuals. Examples of these divergent points of view include that of a retired technical data manager of a large electronics firm having FOMM experience (*Ref. 31*), and of a principal of a firm specializing in the development of FOMM publications (*Ref. 73*).

- From *Reference 31*:

SIMM-FOMM

The SIMM concept was an attempt to do a better job than the traditional technical manual. SIMM *did not attempt* to do a different job. The traditional approach is to teach the theory of design, thus equipping the reader to improvise troubleshooting procedures on the job, in reaction to situations confronting him, and according to the way he judges them. Thus the SIMM can be characterized as a self teaching aid for design theory, for theory of operation and, (backed up with reference material) for the maintenance technician. The most outstanding feature is the Maintenance Dependency Chart which is a highly compact form (matrix) of a logic schematic with functional dependencies indicated with simple symbols, few in number. The reader is not told what to do, or how to do it, or when to do it. It is assumed that the reader has diagnostic aptitude; that he knows how to use test equipment; that he knows how to make repairs; and that he has fault isolation experience.

AD-A099 779 BIOTECHNOLOGY INC FALLS CHURCH VA F/G 5/1
TECHNICAL ORDER MANAGERS REFERENCE DATA.(U)
MAY 81 G R HATTERICK, H E PRICE F33615-78-C-0016
UNCLASSIFIED AFHRL-TR-80-51 NL

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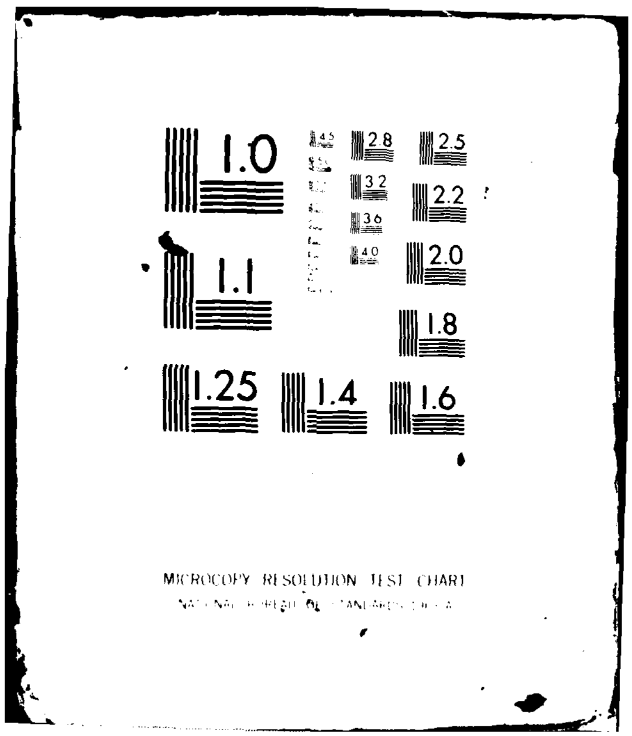

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART

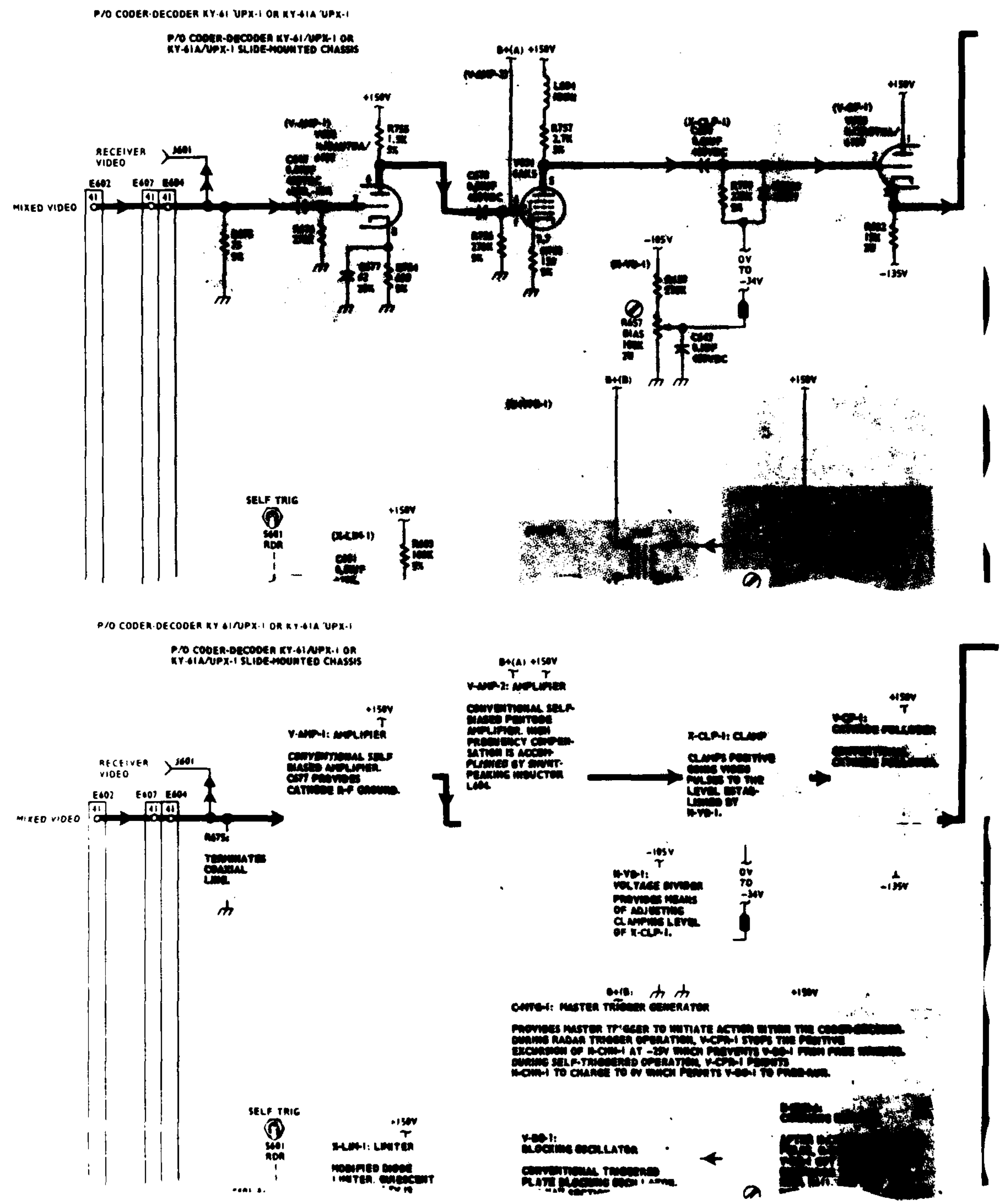


Figure 3-3.—Examples of SIMM Blocked Schematic (Upper) and Blocked Schematic Text (Lower) (Excerpted from NAVSHIPS 0967-077-5000, Figure 2-1 and 2-2, Writer's Preparation Guide for Symbolic Integrated Maintenance Manuals (SIMM) (Electronics), 1965)

There are four significant disadvantages:

1. SIMM has the highest production cost of any technical manual concept.
2. SIMM does not appeal to readers.
3. Effectiveness is largely limited to electronic analog circuitry. Of no value at all in the maintenance of computer-type circuitry, and of little value (in most cases no value) for mechanical equipment.
4. Very few printers will undertake to print SIMM charts.

- From *Reference 73*:

  The FOMM concept . . . recognizes that the diagram is the prime communication media. Most important, the diagram is not susceptible to reading comprehension limitations. Text which is subject to those limitations is limited to that requirement to support the diagrammatic communication vehicle. Additionally, FOMM recognizes that maintenance personnel want the text packaged as a reference document, not as a novel. They want instant access to the desired information without wading through volumes of data . . . .

  In Functionally Oriented Maintenance Manuals, data is packaged for the convenience of the user. The data packaging concept is flexible and can be adapted to any maintenance echelon concept . . . .

  For system maintenance, visibility is again the key note to simplicity. Since the whole scheme of documentation is organized scan-zoom and circuit related, the back-up material for the maintenance process is organized along the natural lines of thought of a technician trying to fault isolate a system. He has the scan-zoom visibility to start with system symptom, and work his way down to removeable parts at the level authorized for his particular maintenance echelon . . . .

  Without the functional documentation, it is very easy to go off on a tangent in a logical maintenance process and spend time searching in the wrong place for the trouble. The functional documentation prevents this. It enables the technician to proceed logically through the process of fault isolation, and with this documentation it is very easy for him to keep track of where he is and what he is doing.

  If he does inadvertently go off on a tangent, then with this documentation as a base, he will be more likely to reorient himself in the midst of the process and return to the right path. Without this documentation, he would probably have to go back to the beginning and start over each time he made a logical but wrong assumption.

For additional information on the early versions of this technique, see *References 11, 14, 33, 34, 17, 18, 63, & 68.*

3.3.4 *ANL*—ARMY NEW LOOK. The "New Look" concept is another example of an experimental technique which founded a particular type of format, then rapidly gave way to its successors with different names and somewhat changed characteristics. ANL was the springboard from which, first, ITDT (Integrated Technical Documentation and Training) and, later, SPA (Skill Performance Aids) arose. The principal characteristics, which are traceable through this evolution, are very much simplified procedural steps and greatly simplified drawings (see AFHRL-TR-80-50, Section 4). Even the use of cartoons were and are permitted under some circumstances.

The guidelines documents that presently comprise the SPA specification packages are the result of an innovative approach to TMs initiated by the Army in 1970 (*Refs. 111, 112, 113, 18, 46, 14, & 67*). Initially, the Army Weapons Command had experimented with a "New Look" operator's manual, which resulted in a pocket-sized manual for the M60 machine gun. This concept was variously referred to in the literature as Army New Look (ANL) (*Ref. 46*), User's Manuals (*Ref. 67*), and Neo-Stylized (NEOS) (*Ref. 14*) manuals. The requirements for this concept were documented in a draft specification, MIL-M-630XX(TM), "For Preparation of 'New Look'-10 Operator Technical Manuals for Weapons, Combat Vehicles, Trucks, Generator Sets, Construction and Material Handling Equipment, Radios, Test and Diagnostic Equipment and Audio-Visual Equipment." Subsequently it was formalized as MIL-M-63036(TM), "Preparation of Operator's Technical Manuals."

Most of the research that followed was directed at maintenance manuals. The chronology of significant events was reported in *Reference 111*:

EVOLUTION OF SKILL PERFORMANCE AIDS

1. Numerous studies over the past twenty years on the format and content of maintenance information indicated that faster and better maintenance can be done if technicians use job performance aids. As early as October 1970, the concept of "New Look" publications began with the pocket-sized operator's TM for the M60 machine gun.

2. In 1973, the DOD Advance Research Projects Agency (ARPA) published a report on improving DOD maintenance performance through better performance aids. This report determined potentials for improving maintenance and reducing costs using innovative techniques like those used in Skill Performance Aids. This report recommended funding of an Army portion of the DOD "Low Cost Ownership Program" to improve military technical information transfer methods.

3. In 1974-1975 two companies (RCA and Kinton) were contracted by DARCOM to survey all studies and evaluations and publish a survey result. The same companies were directed to develop a specification which would use the results of the survey.

4. RCA developed a specification using a logic tree, flow diagram troubleshooting methodology. Specification was developed from a maintenance engineering point of view.

5. Kinton specification focused on human engineering point of view, emphasizing a thorough front end analysis.

6. Start of the SPA Program.

   a. In May 1975, ITDT General Office Steering Committee was formed and selected the Kinton specification to be used with two fielded systems (tank turrets and wheeled vehicles) for pilot projects.

   b. Since that start date, specification changes and resultant contractual modifications have delayed fielding of the initial SPA package.

The two studies mentioned here are reported in *Reference 18* (Kinton), and *References 112 & 113* (RCA). The Kinton effort produced draft specification MIL-M-632XX(TM) for "Improved Military Documentation and Training" (ITDT). Part I presented requirements for content analysis (especially Behavioral Task Analysis) and the preparation of Job Performance Manuals (JPM) and Job Performance Guides (JPG). Part II presented requirements for preparing training materials to support JPMs and JPGs. After a series of revisions, MIL-M-632XX Parts I and II became formal military specifications MIL-M-63035(TM), MIL-M-63038(TM), and MIL-M-63040(TM).

The draft specification produced in the RCA effort was designated MIL-M-633XX(TM), "Formats for Maintenance Procedures and Information." Although the Kinton specifications formed the main thrust of the ITDT effort, the RCA specification was also subsequently formalized as MIL-M-63037(TM). As was pointed out in the SPA discussion in AFHRL-TR-80-50, this specification is still active but is not currently a part of the SPA program.

Concurrently, Hughes Aircraft Company, under contract to the Army, developed MIL-HDBK-63XX-1, "Technical Manual Writing Handbook," and MIL-HDBK-63XX-2, "Technical Writing Style Guide." These were formalized as MIL-HDBK-63038-1(TM) and -63038-2(TM), respectively, companion documents to MIL-M-63038(TM).

3.3.5 OTHER INNOVATIVE APPROACHES. The preceding paragraphs have briefly discussed some of the more significant format-based techniques that resulted from early research in this field. Many others could be described. Excellent reviews of these early innovations are included in the series of reviews published by the Army Supply and Maintenance Command (SMC), Equipment Manuals Field Office (EMFO) at Letterkenny Army Depot (*Refs. 11, 12, 13, & 14*). Other reports that should be examined include the surveys by Shriver and Trexler (*Ref. 89*), Rowan (*Ref. 17*), and the NSIA (*Ref. 82*). As will be seen in these reports, innovation was not restricted to formats. Progress was also being made in finding media-based techniques for presenting/displaying technical data, built-in and peripheral diagnostic equipment to perform (some of) the fault isolation procedures, and computer-aided systems for both training and maintenance were being derived. These areas are outside the scope of this report, so they will not be discussed here.

3.4 FORMAT OPTION CHARACTERIZATION

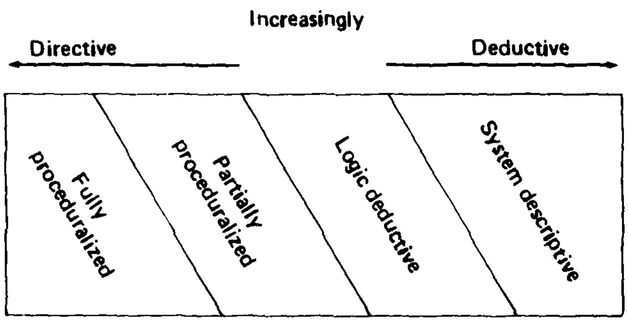
3.4.1 DIRECTIVE VERSUS DEDUCTIVE FORMATS. In the preceding section, several "innovative formats" were described. Each of these techniques has some features in common with the others and some which seem to be unique. To some extent, both the similarities and the differences resulted from the developers' efforts to change the focus of TMs *from* reference material to support prior training *to* instructional material for use on the job. Thus, PIMO maintenance manuals were developed to be highly proceduralized, i.e., to provide step-by-step instructions for routine maintenance that could be used by relatively inexperienced personnel.

The BAMAGAT approach was aimed at providing *better* reference materials for use by more experienced personnel. These differences in the level of proceduralization have come to be called "format options" (*Ref. 21*). Concepts which were basically of a reference nature were termed *deductive aids*; concepts which described procedures to be followed were termed *directive aids*.

Deductive aids which provided basic factual information about a system or item of equipment were called "System Descriptive" (SD) aids or formats; those which combined the basic facts with a graphic expression of functional interrelationships were called "Logic Deductive" (LD) formats. On the directive side, two levels of proceduralization were recognized: "Fully Proceduralized" (FP) and "Partially Proceduralized" (PP) formats. Fully proceduralized formats listed each step, at the lowest level necessary for full understanding required to complete a task or activity. Partially proceduralized formats listed only the major steps of a task, leaving it to the technician to determine the detailed step, based on prior training and experience. Thus, four format options were recognized:

Directive		Deductive	
Fully Proceduralized	Partially Proceduralized	*Logic* Deductive	*System* Descriptive

This characterization implies neat compartments for each of the various format options, into which any particular format could be placed. In reality, the borders between format options are indistinct, so that a particular format should more properly be placed somewhere on a directivity/deductivity continuum:



Although this representation is somewhat more accurate, it still does not take into account all of the possible combinations of directivity and deductivity which may exist within a particular technique. PIMO manuals, for example, were fully proceduralized for routine maintenance actions such as remove/replace, logic deductive in the troubleshooting volumes, and system descriptive for theory of operation. Thus, while PIMO is most widely known as a fully proceduralized format, it is actually a combination of format options.

3.4.2 HYBRID FORMATS. An approach that has received considerable attention in recent years is known as a *hybrid*, in which two (or more) format options are used in combination *in the same presentation*. These are also sometimes called "dual-level presentation aids." Theoretically, any two format options can be combined. In practice, most hybrids are combinations of adjacent format options (e.g., *partially proceduralized plus fully proceduralized, or logic deductive plus partially* proceduralized). This approach provides an increased level of directivity for the technicians who need it, but retains the more deductive material for reference for the more experienced technicians who do not require detailed instructions. Figure 3-4 illustrates a hybrid of partially and fully proceduralized instructions. Figure 3-5 illustrates a hybrid of partially proceduralized and simple logic deductive aids.

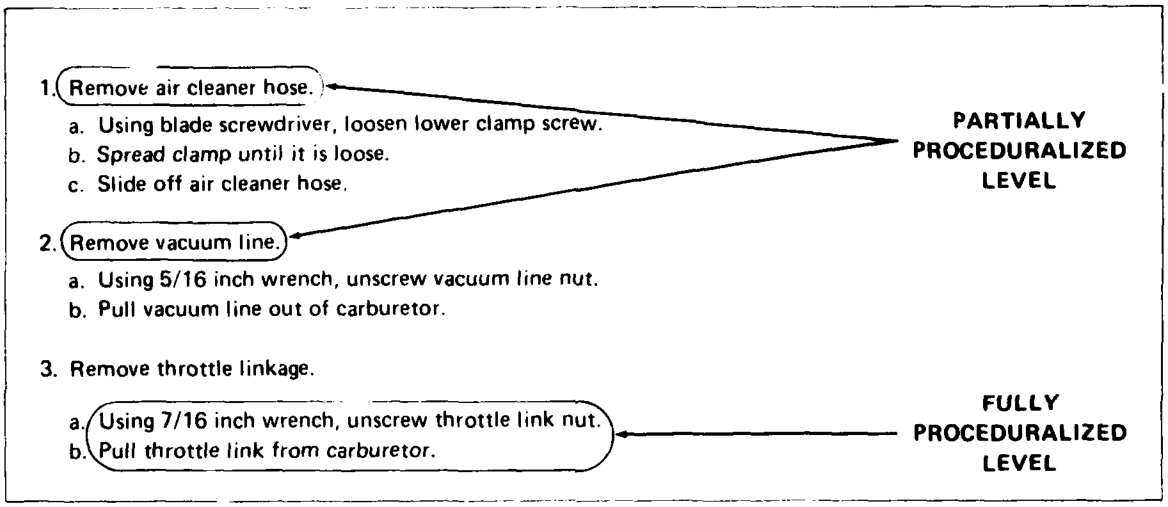
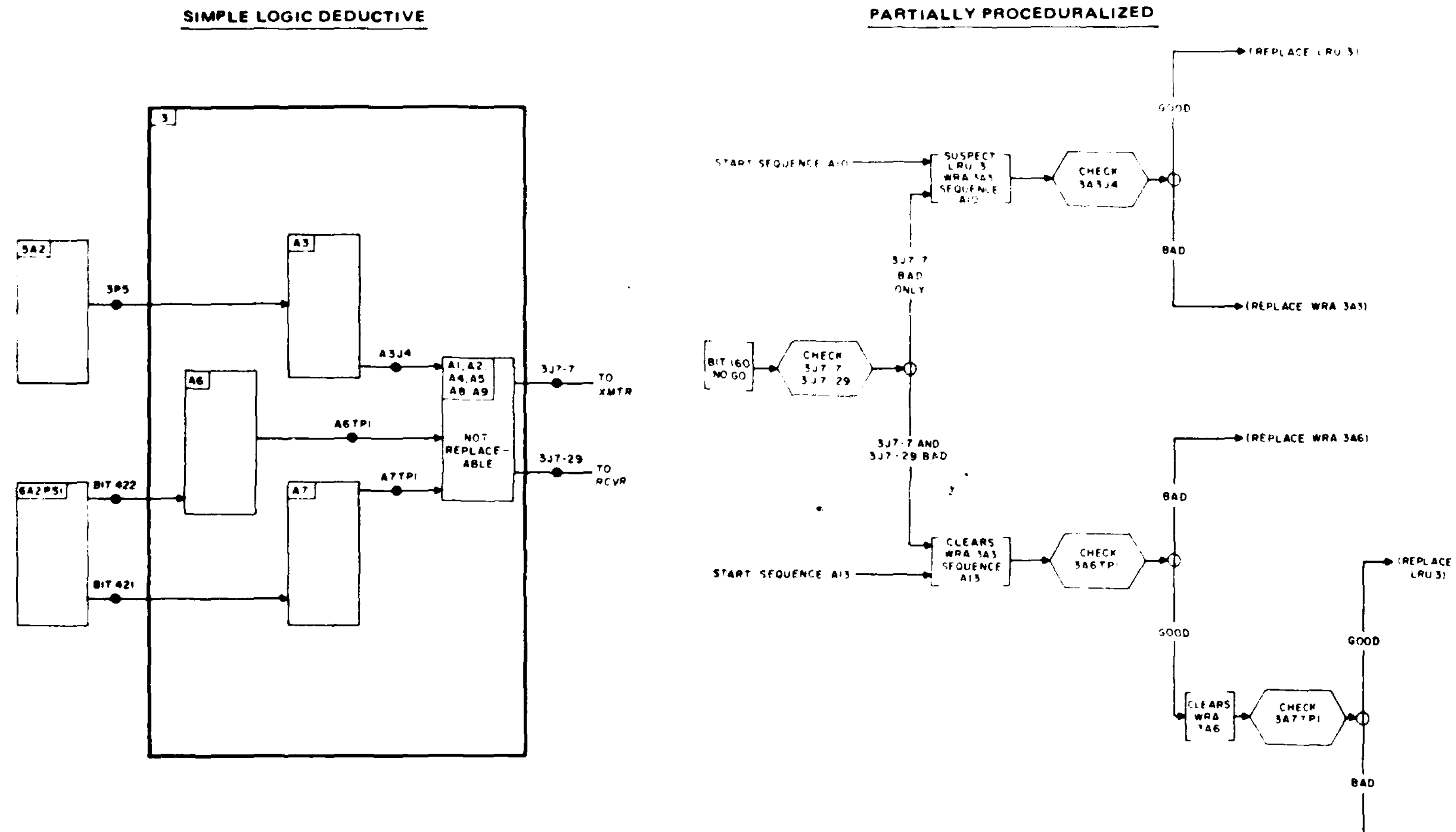


Figure 3-4.—Example of Hybrid Format; Fully Proceduralized and Partially Proceduralized (From DOD-STD-1685)

According to some researchers (*Ref. 1*), the Augmented Action Tree (AAT) technique, illustrated in Figure 3-5, is the only true attempt at hybridization of formats. Actually, however, the principles of hybridization exist in many different formats.

3.4.3 CHARACTERIZATION BY APPLICATION. Developers of innovative formats must contend with a principle recognized by early researchers in the field: If procedures are going to satisfy the needs of the users, consideration must be given to the particular application. A format that is satisfactory for maintenance applications may be totally unsatisfactory for operating instructions. Likewise, formats that support troubleshooting and fault isolation activities may be of little use in remove/replace maintenance actions. Consequently, format options are characterized not only by



a. BIT 160 LRU 3 Troubleshooting Block Diagram

b. BIT 160 LRU 3 Decision Action Tree

Figure 3-5.—Example of Hybrid Format; Partially Proceduralized and Simple Logic Deductive (Ref. 81)

the extent of proceduralization (directivity versus deductivity), but also by the type(s) of application for which a particular format is most suited. Many different types of application categories have been suggested (*Ref. 58*), but the method that is most compatible with the requirements of the TO Manager, and that will be used in this Handbook, is adopted from *Reference 1*, which classifies applications variously as:

- Operation
- Maintenance
  - Troubleshooting/Fault Isolation
  - Removal/Installation
  - Special Case Maintenance Actions.

Special case maintenance actions comprise a grouping of otherwise unrelated non-troubleshooting (NTS) activities, which includes especially complex tasks, Standard Operating Procedures (SOPs), periodic actions, time-critical or hazardous conditions, one-trial learning tasks, and tasks associated with highly complex integrated systems (*Ref. 24*).

When characterization by application is combined with characterization by level of proceduralization, the format option characterization table such as is shown in Figure 3-6 results.

	Level of Proceduralization					
	√	Directive		Deductive		Other
APPLICATION:		FP	PP	LD	SD	
Troubleshooting/Fault Isolation:	√		√	√		Hybrid
Removal/Installation:	√		√			
"Special Case" Maintenance Actions:	√	√	√			Hazardous Cond.
Operation:						
Other: ____________						

Figure 3-6. – Format Option Characterization by Application and Level of Proceduralization

The checkmarks in this example are for a hypothetical format that can be used for both TS and routine NTS activities, as well as for one type of special case maintenance action. In this case, the level of proceduralization differs for each application.

3.4.4 USE FACTORS. The entries in the format option characterization table in Figure 3-6 divulge a great deal about a particular format and what its strengths or weaknesses may be. However, these characterizations are insufficient by themsleves for determining the most appropriate use of the technique for a particular system, or whether the technique should even be considered for the system. Even for a "quick-look" appraisal of suitability, much more must be known *about the* types

of equipment and personnel which it best supports, its physical character, and so forth. Although researchers have identified many different descriptors for the remaining attributes, they generally fall into the following five categories:

- *Physical Character*—Printed materials; Manual Devices; Powered Equipment
- *Information Format*—Verbal; Pictorial; Diagrammatic; Tabular
- *Sensory Channel*—Visual; Audio; Audio/Visual; Other
- *Personnel Qualifications*—Highly Skilled; Skilled, Semi-Skilled; Unskilled
- *Type of Equipment*—Electrical/Electronic; Mechanical; Other.

When these "use factors" are combined with the information in the format option characterization table, a more complete characterization of the format emerges, as illustrated in Figure 3-7. While this characterization does not describe all there is to know about a particular technique, it permits a quick, reasonably complete appraisal of the major attributes for purposes of determining interest.

APPLICATION:	√	Directive		Deductive		Other
		FP	PP	LD	SD	
Troubleshooting/Fault Isolation:	√		√			
Removal/Installation:						
"Special Case" Maintenance Actions:						
Operation:						
Other: ____________						

USE FACTORS:

Physical Character: Printed Materials ___√___ ; Manual Devices ________ ; Powered Equipment ___√___ .

Information Format: Verbal ___√___ ; Pictorial ________ ; Diagrammatic ___√___ ; Tabular ________ .

Sensory Channel: Visual ___√___ ; Audio ________ ; Audio/Visual ________ ; Other ________ .

Personnel: Highly-Skilled ________ ; Skilled ___√___ ; Semi-Skilled ___√___ ; Unskilled ________ .

Equipment: Electrical/Electronic ___√___ ; Mechanical ___√___ ; Other ________ .

Figure 3-7. —Format Option Characterization of Trouble Analysis Procedure (TAP)

3.4.5 FORMAT HIERARCHIES. It should be apparent at this point that any particular format is characterized by a potentially large number of variables, which the application and use factors in Figure 3-7 merely summarize. The four types of information format factors, for example, are intended to summarize up to 40 "presentation components," which some researchers (*Refs. 76, 77*) have identified as making up the population of JPA formats, as illustrated in Table 3-1. Lists such as this one, or such as the format option characterization tables, can describe in some detail the factors associated with a particular format technique. The manner in which the technique is organized, however, is open to question. As has already been seen in the preceding section of this chapter, a particular technique may have many components, or few; it may have many areas of application, or only a limited number. Conversely, some "components" are found in many different techniques,

Table 3-1.—Categorization of "Presentation Components" Comprising JPA Format (Constructed from data in Refs. 76 & 77)

Source	Hughes/NTIPP (Ref. 77)												Powers/NTIP (Ref. 76)						
Format Categories	Pictorial Representation				Diagrammatic Representation				Text		Condensed Data								
Presentation Components	Portrayal	View	View Type	Locators/ Identifiers	Blocks	Inter-connections	Hybrid Blocks	Servicing	Mode	Style	Lists	Tables/ Matrices	Photograph	Drawing	Diagram	Graph	Text	Table	Matrix
1. Photograph	✓												✓						
2. Airbrushed photograph	✓												✓						
3. Airbrushed drawing	✓													✓					
4. Sketch	✓													✓					
5. Engineering drawing	✓													✓					
6. Two-dimensional view drawing		✓												✓					
7. Three-dimensional view drawing		✓												✓					
8. Assembled view drawing			✓											✓					
9. Disassembled (exploded) view drawing			✓											✓					
10. Cut-away view drawing			✓											✓					
11. Superimposed				✓															
12. Coordinate				✓															
13. Line and leader				✓															
14. Overall block diagram					✓										✓				
15. Detailed block diagram					✓										✓				
16. Schematic diagram						✓									✓				
17. Wiring diagram						✓									✓				
18. Cabling diagram						✓									✓				
19. Functional signal flow diagram						✓									✓				
20. Digital logic diagram						✓									✓				
21. Blocked schematic diagram							✓								✓				
22. Blocked digital logic diagram							✓								✓				
23. Pictorial block diagram							✓								✓				
24. Timing diagram								✓							✓				
25. Maintenance dependency chart								✓							✓				
26. Decision tree								✓							✓				
27. Waveform								✓								✓			
28. Graph								✓								✓			
29. Directive text									✓								✓		
30. Deductive text									✓								✓		
31. Continuous text										✓							✓		
32. Segmented text										✓							✓		
33. Retrieval-oriented list											✓							✓	
34. Glossary/abbreviations											✓							✓	
35. Materials list											✓							✓	
36. Wire list											✓							✓	
37. Procedures table												✓						✓	
38. Specialized data table												✓						✓	
39. *Specialized data matrix*												✓							✓
40. Retrieval-oriented matrix												✓							✓

and others in very few. It has been suggested (*Ref. 32*) that JPA technology can be organized into three levels (for both research and application purposes), wherein each level can be considered to have a number of distinguishing characteristics. These levels are: (1) the JPA System level, (2) the performance aid component level, and (3) the performance aiding element level. Figure 3-8 illustrates the conceptual model for this type of characterization.

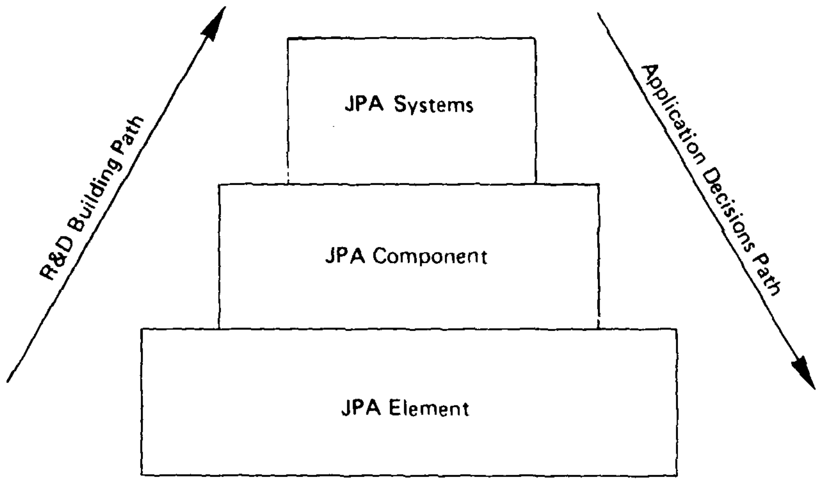


Figure 3-8.—Conceptual Organization of JPA Technology (Ref. 32)*

The validity of this concept is recognized, but the three levels proposed were found to be too broad to use as a mechanism for characterizing a particular technique or format. The six-level "hierarchy" of format characteristics (discussed in AFHRL-TR-80-50, Section 3) was therefore defined, based on this concept.

Figure 3-9 illustrates how use of the indentured hierarchy places the format option characterization of the *Trouble Analysis Procedure* (TAP) into a systems context.

3.5 PREPARATION GUIDELINES

3.5.1 SIMPLE SPECIFICATIONS. Long before the military services became concerned with improving technical manuals or other means of transmitting technical procedures, specifications were available that contained requirements and/or guidance for the preparation of manuals. These specifications could, as now, be placed on contract or be used by the service's organic preparation capability to guide preparation. Most specifications were general, and did little to establish the nature of the manual. Differences among specifications were primarily a function of the type of equipment or system rather than the type of data.

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Short Title: TAP

Title: Trouble Analysis Procedure

☐ JPA System (*) ☐ Primary Format (●) ☑ Format (▲) ☐ Subordinate Format (◆)

☑ Other: Media - microfilm storage & retrieval

INDENTURE:

```
* SAFEGUARD . . . . . Safeguard System
  ● MDS . . . . . . . . Maintenance Data System
      ◆ GIF . . . . . . . . . General Information Frame
      ◆ LIF . . . . . . . . . Location Information Frame
      ◆ PML . . . . . . . . . Preventive Maintenance List
      ◆ RPDL  . . . . . . . . Repair Parts Data List
    ▲ MPD . . . . . . . . . Maintenance Procedure Diagrams
      ◆ APD . . . . . . . . . Adjustment Procedure Diagrams
      ◆ CPD . . . . . . . . . Check Procedure Diagrams
      ◆ IPD . . . . . . . . . Inspection Procedure Diagrams
      ◆ OPD . . . . . . . . . Operation Procedure Diagrams
      ◆ TPD . . . . . . . . . Test Procedure Diagrams
    ▲ MPI . . . . . . . . . Maintenance Procedure Instructions
      ◆ DAP . . . . . . . . . Disassembly & Assembly Procedure
      ◆ LP  . . . . . . . . . Lubrication Procedure
    ▲ FBD . . . . . . . . . Functional Block Diagrams
      ◆ BD  . . . . . . . . . Basic Diagram
      ◆ IFD . . . . . . . . . Interface Diagram
      ◆ ISD . . . . . . . . . Isolation Diagram
    ▲ WD  . . . . . . . . . Wiring Diagram
──► ▲ TAP . . . . . . . . . Trouble Analysis Procedure
    ▲ SD  . . . . . . . . . Schematic Diagram
      ◆ LD  . . . . . . . . . Logic Diagram
      ◆ SDND  . . . . . . . . Schematic Diagram/Non-Digital
```

FORMAT OPTION CHARACTERIZATION

APPLICATION:

	✓	Directive		Deductive		Other
		FP	PP	LD	SD	
Troubleshooting/Fault Isolation	✓		✓			
Removal/Installation						
"Special Case" Maintenance Actions						
Operation						
Other ______						

USE FACTORS:

Physical Character Printed Materials ✓ ; Manual Devices ______ ; Powered Equipment ✓

Information Format Verbal ✓ ; Pictorial ______ ; Diagrammatic ✓ ; Tabular ______

Sensory Channel Visual ✓ ; Audio ______ ; Audio/Visual ______ ; Other ______

Personnel Highly-Skilled ______ ; Skilled ✓ ; Semi-Skilled ✓ ; Unskilled ______

Equipment Electrical/Electronic ✓ ; Mechanical ✓ ; Other ______

Figure 3-9.—Characterization of the Trouble Analysis Procedure (TAP) *Format*

As more specialized types of data (such as checklists and parts breakdowns) came into use, the requirements documents became more specific to the type of data to be produced. Sections of specifications, or sometimes entire documents, were dedicated to such preparation requirements.

3.5.2 SPECIALIZED REQUIREMENTS DOCUMENTS. With the emergence of innovative formats, new specifications had to be prepared. Among the earliest of the formal JPA specifications were MIL-5-83302 (USAF), "Job Performance Aids, Advanced-Type, for VNAF Organizational Maintenance," and MIL-M-24100 (SHIPS), "Symbolic Integrated Maintenance Manuals (SIMM) for Systems and Equipment." Frequently, guidelines would be issued in the form of Technical Reports (e.g., AFHRL-TR-73-43) or "draft" specifications (e.g., MIL-M-632XX) before becoming formal specifications. As formats became more complex, preparation requirements became more extensive and definitive. ventually, separate handbooks were prepared to supplement the specifications, in order to provide interpretive guidance. Examples include:

- FOMM — MIL-M-24100B: Military Specifications, Functionally Oriented Maintenance Manuals (FOMM)

  MIL-HDBK-242: Functionally Oriented Maintenance Manuals (FOMM) Writer's Guide

- ITDT/SPA — MIL-M-63038: Military Specifications, Organizational or Aviation Unit, Direct Support or Aviation Intermediate, and General Support Maintenance Technical Manuals

  MIL-HDBK-63038-1: Technical Manual Writing Handbook

  MIL-HDBK-63038-2: Technical Writing Style Guide.

Examination of Section 7 clearly reveals that guidelines for many different combinations of equipment type, maintenance level, and format type are available. It should also illustrate that "picking" a specification is not a simple matter. Obsolete specifications are a particular problem, since they frequently survive long after their usefulness has ceased.

3.6 COST FACTORS

3.6.1 ESTIMATED COSTS. Any discussion of JPAs, innovative formats, improved maintenance data, etc. inevitably leads to the topic of costs. Almost without exception it is concluded that the newer techniques are more costly than conventional TOs. This is probably true. Certainly it is true that contractors' estimates for preparing any of the newer JPAs will almost always be higher than for conventional documentation. For example, it is reported (*Ref. 17*) that cost estimates for the F-15 aircraft included $35 million for conventional TOs versus $45 million for JPAs, an increase of 29 percent. Most estimates indicate that the costs of JPAs are 100 percent to 125 percent that of conventional documentation, although much larger percentages are not unusual. In at least one case, Seek Point, JPA cost estimates were less than conventional TOs (*Ref. 17*).

With the general tendency toward higher costs for JPA formats, it is understandable that program managers are resistant to converting to the innovative formats . . . Or is it?

3.6.2 COST EXPERIENCE. In a recent Air Force study (*Ref. 50*), an attempt to identify cost drivers and experience with TOs revealed that only rarely have the data been available to make a valid comparison of costs. In one case, however, a comparison was possible. The airframe TOs for the C-130B aircraft, produced in the early 1950s, cost approximately $1.8 million. Airframe TOs for the C-5 in the 1970s, produced to the same specification (MIL-M-25098), cost approximately $20 million. The inflation factor was 1000 percent–for *conventional* TOs, produced by the same contractor. The differential between the C-130A, for which the original C-130 data were prepared, and the C-5 was over 600 percent. Some of this increase is certainly attributable to dollar inflation, and some to differences in the two aircraft. Some of the increase must be ascribed to the preparation of more detailed procedures, even in conventional manuals, since page count in other programs has shown similar, though not as great, increases (illustrated in Figure 3-10).

The study also addressed the cost comparison between conventional maintenance manuals and Job Guide Manuals (JGM). The cost per page of conventional manuals is very difficult to verify, since historical data of this type are generally not available. Contractors' estimates may range from $100 to $200 per page. In one recent aircraft system, the cost per page for conventional TOs averaged $235. When maintenance manuals for certain systems of the C-5 and C-141 were converted from conventional to Job Guide Manuals, the cost per JGM page was $250 for the C-5 and $91 for the C-141. While this range is not too different from that seen for conventional manuals, the number of pages for the C-141 tripled, while for the C-5 it increased by a factor of 8.

Another view of comparative costs is provided by the experience of a major contractor (*Ref. 33*) who has reportedly prepared over 50,000 pages of JPA-type data. As shown in Table 3-2, both the number of pages and the cost per page can be expected to increase when JPAs are substituted for conventional data. The author of that report has calculated that, for certain types of JPA combinations, the JPAs would cost three (3) times as much.

Table 3-2.–Volume/Cost Differences Between CTMs and JPAs (Adapted from Ref. 33) *

Conventional Technical Manuals in Page Units X (Times) Factor

Category	SIMMS/FOMMS FPS-27	MDCs Only FPS-27	C-141A JPAs	XM1 ITDT
Volume	1.25	3.60	1.52	3.50
Cost	1.68	1.00	1.12	0.80
Total	2.10	3.60	1.70	2.80

3.6.3 REASONS FOR INCREASED COST OF JPA FORMATS. Some of the reasons for JPA formats costing more than their conventional predecessors are obvious: Inflation has caused everything to increase in cost; the greater number of pages required increases costs; greater system complexity requires more data, which increases costs. Other reasons may be less obvious:

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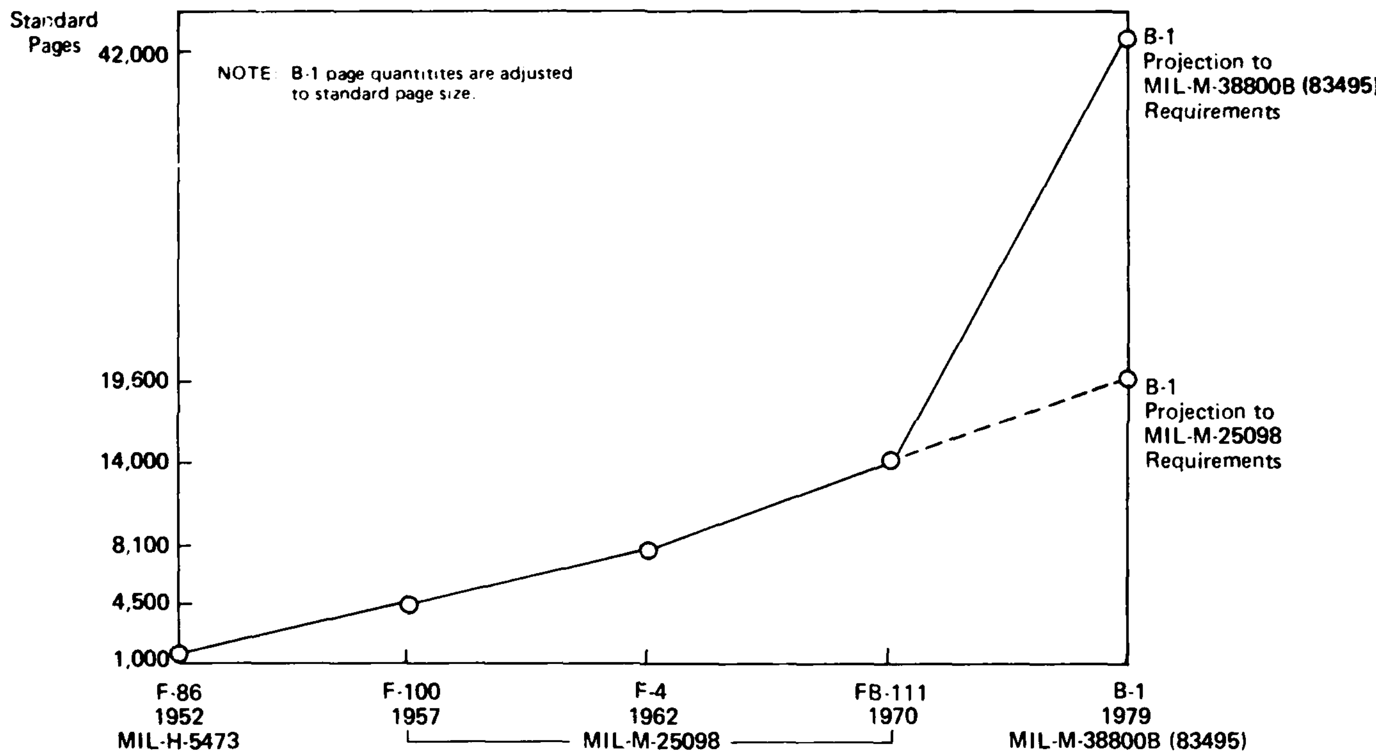

Source: A report of -1 Maintenance Manual Growth from Capt. J. Greene (B-1 TOMA) to Maj. Furlong (AF/IG), undated.

Figure 3-10.—Growth in Page Count for Aircraft Maintenance Manuals (Ref. 50)

- JPA specifications frequently require the conduct of task analyses to produce input data for the JPA formats. The cost of the task analysis becomes part of the cost of the JPA TOs. In the past, when task analysis was conducted it was a system engineering requirement, and the TO program did not have to pay for it. (Note, however, that if the various program elements are not well coordinated, task analysis may be "purchased" twice.)

- JPA formats must be especially accurate, since there is less opportunity for alternative work-around approaches. This requirement imposes extra preparation effort on the contractor, including more time involved in validation and verification.

- There are relatively few contractors who are experienced in the preparation of JPA formats, leading to costs incurred for learning time and higher "risk." This factor will decrease in importance as JPAs become more widely adopted.

The increased cost of JPA formats can be explained, therefore, on the basis of increased investment in the preparation and quality assurance of improved data. Is the investment cost justified?

3.6.4 LIFE CYCLE COST REDUCTIONS. Earlier in this section some examples were presented of the potential benefits to be realized from the use of various types of JPA formats. These included reductions in training time, decreased maintenance downtime, fewer parts utilized, and more effective personnel utilization. All of these are "manpower and logistics" factors which are not part of a program manager's system acquisition budget for hardware. The significance of this can be realized from the following statement:

> . . . manpower and logistics are expected to comprise 71.5 percent of the FY 1980 DoD budget. This amounts to slightly over $100 billion. Of this, we expect manpower costs to total $70.8 billion and training costs to be $6.1 billion. (*Ref. 103*)

From a different viewpoint:

> Maintenance, operations, and personnel costs as shown account for an estimated 50% of a system's total life cycle costs and are projected to account for this portion in the future. (*Ref. 102*)

And yet another:

> Costs of acquisition and ownership shall be established as separate cost elements and translated into firm design-to-cost and life cycle cost requirements for the system selected for full-scale engineering development. System program actions shall be evaluated against these requirements with the same rigor as the evaluation of technical requirements. (AFR 800-2, *Acquisition Program Management*, Attachment 2 [DOD Directive 5000.2])

In this light, the resistance of program managers to more costly innovative formats is not understandable *if* there is a high probability of reducing the life cycle cost of the system.

Is the investment worth it? In a study performed by Westinghouse (*Ref. 33*), the results of two JPA effectiveness studies were evaluated in an Air Force Logistics Support Cost (LSC) model for a standard Westinghouse-developed radar. The effectiveness data are shown in Tables 3-3 and 3-4. When the data were entered in the LSC model, for a 14-year life cycle, it was projected that an overall 11 percent cost savings (almost \$3 million) would result (as shown in Table 3-5). This was for a radar system that required relatively little training to begin with.

Table 3-3.–AN/AWG-10 MDCs (Ref. 33)*

	Percentage
• Reduction Obtainable:	
False LRU Removal	65
Mean Fault Isolation Time	32.6
MTTR	18.2
Maintenance Actions/On-Line Period (2 Squadrons)	21.7
Attempts to Isolate a Fault	36
Maintenance Man Hrs./Month (F4J Fleet)	35
Spares Cost/Month (F4J Fleet)	46
• Increases Obtainable:	
Sorties/Day (1 Squadron – 12 A/C)	5

Table 3-4.–C-141A PIMO Study Results (Ref. 33)*

	Percentage
Results Indicate Job Performance Aids:	
• Reduce Search and Retrieval Time	50
• Reduce Error Rate	75
• Reduce Spares Demand	30
• Reduce Manpower Demands	35
• Reduce Time in Training	25

These Results Yield an Overall MTTR Reduction of 40%

Table 3-5.–LSC Model Summary (Ref. 33)*
(All Dollars are 000)

	Pipe-line Spares	Replace-able Spares	On-Line Mainte-nance	Off-Line Mainte-nance	Inven-tory Entry	Support Equip-ment	Train-ing	Publica-tions	Total Cost	Avail-ability
Conventional T.M ($)	8474	1760	406	4397	4711	5624	134	1738	27 144	930043
JPA ($)	5931	1232	263	2858	3297	5624	100	5214	24 419	940813
Percent Change	-30	-30	-35	-35	-30	0	-25	+300	-11	+1

A similar, but even more impressive, conclusion was reached in an Air War College report (*Ref. 104*). It was calculated that in the C-141A fleet alone, after the investment in improved data was written off, a \$23.23 million saving in *training* costs would be realized over a six-year period by the use of JPAs.

It will be up to the TO Manager to encourage the SPO Manager to recognize the life cycle cost significance of innovative job performance aids, and to make the right format selection decision to ensure that such savings can be realized.

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SECTION 4. JOB PERFORMANCE AID CONCEPTS AND TECHNIQUES

4.1 INTRODUCTION

The tables that comprise this section are based on a survey of proposed and/or promoted job performance aids conducted to identify candidate JPAs for inclusion in this technical report. The tabular documentation of the screening process provides basic information about each technique, e.g., short and full title, the origins or sponsors of the method, its basic characteristics, and its development status. While this listing may not include *all* potential JPAs, and may contain errors of both omission and commission, it is based on the best information available at the time of the analysis. The listing is included here to serve as a quick reference to techniques that the TO Specialist may find in contractor documentation or in the research literature.

4.2 LEGEND AND NOTES

*The SHORT TITLE is, generally, the commonly used acronym or abbreviation found in the literature. When none existed, a SHORT TITLE was arbitrarily derived from the title or description of the technique.

**The CHARACTER columns provide a quick reference to the important attributes of the technique with respect to the objectives of this project. The basis of comparison is the "conventional" or "standard" maintenance manual.

- FORMAT: The technique has significant characteristics related to format or content, e.g., the type of material included, the manner of organization, the informational techniques, etc., for performing maintenance.
- MEDIA: The technique has significant characteristics related to media, i.e., the manner of presentation of the material to the user. It may be equipment oriented (e.g., a CRT), an unusual use of the print medium (e.g., color, graphics), or some other method.
- DELIVERY: The technique has significant characteristics related to the production of procedural data and or delivery of the data to the user in the field; includes storage retrieval techniques.
- DIAGNOSIS: The technique utilizes peripheral or built-in test equipment to diagnose problems and provide direction for corrective action.
- TRAINING: The technique has significant characteristics related to the training of personnel to become skilled in the operation or maintenance of systems and equipment, either in the classroom or in OJT.

X The characteristic in this column is significant, but not dominant.

0 The characteristic in this column is the dominant, or distinguishing, attribute of the technique.

? The characteristic in this column is inferred but has not been confirmed.

a The techniques listed here have been included in other listings as actual or potential methods for improving the conduct of maintenance and repair activities. Inclusion in this list is not intended to substantiate any claims of value. Principal sources were *References 2, 11, 12, 13, 14, and 18.*

- DATA (Descriptive/Field Test/Specifications): Entries in these columns are based on *known availability* of basic descriptions of the technique, hard data from testing and/or actual use, and specifications or other preparation guidelines. The data were *not necessarily reviewed* in compiling these tables.

- NUMBERED NOTES: Explanatory notes are in numerical order immediately following the tables.

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
AAT	Augmented Action Tree	BioTechnology/NAVAIR	●					Yes	Yes	Some	1; 2; 15;
ACEP	(Unknown)	U.S. Army ?	?					Unk.	Unk.	Unk.	3; 84;
ADDS	Advanced Data Delivery Systems	Hughes Aircraft Co.		X	●			Yes	No	No	88; 83;
ADMIRE	Automated Diagnostic Maintenance Information Retrieval	Westinghouse		X	X	●		Yes	Unk.	Unk.	4; 83;
ADPEP	Automatic Data Preparation Evaluation Program	McDonnell			●			Lim.	Unk.	Unk.	83;
ADPREPS	Automated Documentation Preparation System	NAVORD/NAVSEA			●			Yes	Unk.	Unk.	33; 34; 83;
AF/FPJPA	Air Force Fully Proceduralized Job Performance Aids	USAF	●	X				Yes	Yes	Yes	5; 15; 60;
AF SIMS	(Unknown)	USAF	?					No	Unk.	Unk.	3; 84;
AGCS	Alden Graphic Communication System	Alden, Inc.		X	●			Yes	Unk.	Unk.	6; 7; 83;
AIS	Audio Information System	Bell Labs/U.S. Army	X	●		X		Yes	Yes	Unk.	8; 86;
AMPS	Aegis Maintenance Publications System	RCA/NAVSEA	X		●			Yes	Unk.	Unk.	24; 72; 85; 86;
AMSAS	Advanced Manpower Concepts for Sea-based Aviation Systems	Serendipity, Inc./NAVAIR	●	X			X	Yes	Yes	Yes	9;
AN/GSM-133	AN/GSM-133 Programmer Comparator	Bendix/USAF		X		●		Yes	Unk.	Unk.	10; 83;
ANL	Army New Look	DARCOM	●					Yes	Yes	Yes	57; 73; 89; 91;
ASMSA	(Unknown)	(Unknown)	?					No	Unk.	Unk.	3; 84;
ATOMS	Automated Technical Order and Maintenance Sequence	Boeing	●					Yes	Unk.	Unk.	85; 86;
ATS	Administrative Terminal System	IBM Corporation			●			Yes	Unk.	Unk.	11; 12; 83;
AUTOTEXT	Automated Text Publication System	Lockheed/USN & USAF			●			Yes	Unk.	Unk.	33; 34; 83;
AV/IPU	Audio Visual Industrial Production Unit	Litton	X	●				Yes	Unk.	Unk.	12; 85; 86;
AVIS	Audio-Visual Information System	Bell Labs/U.S. Army	X	●		X		Yes	Yes	Unk.	8; 86;
BA	British Algorithm	British Air Force	?					Yes	Yes	Unk.	97;
BAMAGAT	Block-A-Matic-A-Gram-A-Text	Hughes Aircraft	●	X			X	Yes	Unk.	Unk.	13; 31; 62; 70; 97
BFIC	Binary Fault Isolation Chart	Westinghouse/Nav. Avion. Fac.	●					Yes	Yes	Yes	14; 15; 16;
BFTA	Block Form Troubleshooting Aids	AFHRL	●					Yes	Yes	Unk.	17; 96; 97;
BSD	Blocked Schematic Diagram	(Unknown)	●					Yes	Yes	Yes	87; 92;
C-141	C-141 Aids; C-141 Job Guides	USAF	●					Yes	Unk.	Unk.	5; 97;
CALDR	Computer-Aided Loop Diagram Representations	Technical Communications	?	?				Unk.	Unk.	Unk.	3; 18; 84;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
CALP	Computer-Assisted Logical Processes	(Unknown)		?				Unk.	Unk.	Unk.	3; 84;
CAPADAP	Computer-Aided Performance Aid Development and Production	Applied Science Associates			●			Yes	Unk.	Unk.	83;
CAPT	Computer-Aided Preparation of Text	Auto-Logic/NAVSEA			●			Yes	Unk.	Unk.	33; 34; 83;
CATA	Computer-Aided Trouble Analysis	Vought Aeronautics	?	?		●		Yes	Unk.	Unk.	83;
CGVMS	Computer Graphics and Visual Module System	Wm. A. Fetter		?	●			Yes	Unk.	Unk.	12; 83;
CMG	Condensed Maintenance Guide	Hughes Aircraft	●	X				Yes	Unk.	Yes	19;
CONSD	Condensed Servicing Data	General Electric	●	X				Yes	Unk.	Unk.	97;
CONTEXT	Content Indexing Technique	Vitro Labs			●			Yes	Unk.	Unk.	20; 83;
COST	Concentrated Odor Sensing Technique	ITT		●		X		Yes	Unk.	Unk.	83;
CTM	Conventional Technical Manual	(Various)	●					Yes	Yes	Yes	21;
DACOM (1)	Data Communicator	Letterkenny Army Depot ?		?	?			Unk.	Unk.	Unk.	3; 22; 84;
DACOM (2)	Datascope Computer Output Microfilmer	Recordak Corporation			●			Yes	Unk.	Unk.	22;83;
DAPIL	Digital Assembly Ports Identification Lists	Hughes Aircraft	●					Yes	Unk.	Unk.	85;
DATOM	Data Aids for Training, Operation, and Maintenance	General Electric	●	X		X		Yes	Unk.	Yes	15; 95; 97
DIMATE	Depot-Installed Maintenance Automatic Test Equipment	RCA		X		●		Yes	Unk.	Unk.	10; 26; 83;
DLPA	Dual-Level Performance Aid	(Unknown)	●					Yes	Unk.	Unk.	2; 46; 97;
DSA	Diagnostic Sonic Analyzer	Curtiss-Wright		X		●		Yes	Yes	Unk.	17;83;
EHJPA	Enriched Hybrid Job Performance Aid	BioTechnology/NPRDC	●				X	Yes	No	No	38;69;85;86;2
ELECTROCULAR	Electronic Ocular System	Hughes Aircraft/ONR		●	X			Yes	Yes	Unk.	23; 83;
EMFO	Evaluation of Microprinting by Fotolithgraphic Offset	Letterkenny Army Depot			●			Yes	Yes	Unk.	83;
ETM	*Extension Training Materials*	U.S. Army	?				●	Yes	Unk.	Unk.	35; 83;
FASTI	Fast Access to System Technical Information	General Dynamics		X	●		X	Yes	Unk.	Unk.	24; 83;
FEFI	Flight Engineer's Fault Isolation	Douglas Aircraft	●	X				Yes	Unk.	Unk.	25; 86;
FEFI/TAFI	Flight Engr's Fault Isolation/Turn-Around Fault Isolation	Douglas Aircraft	●	X				Yes	Yes	Unk.	25;27;12;86;
FILESEARCH	Filesearch System	FMA, Inc.			●			Yes	Unk.	Unk.	24; 83;
FIM	Fault Isolation Manual	USAF	●					Yes	Unk.	Yes	52;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
FIMATE	Field-Installed Maintenance Automatic Test Equipment	RCA (?)		X		●		No	Unk.	Unk.	10; 26; 83;
FIRM	Fault-Isolation Reporting Method	Lockheed	?	?		?		Yes	Unk.	Unk.	27; 12; 3; 85; 86
FIST	Fault Isolation by Semi-automatic Techniques	NBS/NAVBUSHIPS		X		●		Yes	Unk.	Unk.	28; 83;
FLAPS	Functional Layout and Presentation System	Hughes Aircraft	X	●				Yes	Unk.	Unk.	83; 85; 86;
FOMM	Functionally Oriented Maintenance Manuals	Navy	●	X			X	Yes	Yes	Yes	13; 30; 31;
FORECAST	<u>F</u>ox, <u>Ford</u>, <u>C</u>aylor, and <u>St</u>icht	HumRRO/Army	●				X	Yes	Yes	Yes	15;
FORECASTE	Enriched FORECAST	Army HEL	?				?	Unk.	Unk.	Yes	3; 17; 84;
FPJPA	Fully Proceduralized Job Performance Aids	Air Force	●					Yes	Yes	Yes	5; 15;
FPTA	*Fully Proceduralized Troubleshooting Aids*	*Air Force*	●					Yes	Yes	Unk.	5; 15; 46;
GAFIPB	German Air Force Illustrated Parts Breakdown	German Air Force	●					Some	Unk.	Unk.	93; 85; 86;
GAM	*General Aircraft Manual*	*Air Force*	●					Yes	Yes	Yes	32; 59; 75;
GM/DRM	General Motors Diagnosis & Repair Manual	GM Corporation	?					Unk.	Unk.	Unk.	3; 84;
GPAM	Graphically Proceduralized Aids for Maintenance	Publication Eng's	●					Yes	Unk.	Unk.	85; 86;
GSM	General System Manual	USAF	●					Some	Unk.	Yes	75; 21;
GVM	General Vehicle Manual	USAF	●					Some	Unk.	Yes	75; 21; 59;
HAWK RM/SCM	HAWK Radar Mechanic Symptom Collection Manual	HumRRO/Army	X				●	Some	Yes	Unk.	84; 86;
HEATHKIT	(Unknown)	Heathkit	?					Unk.	Unk.	Unk.	3; 84;
HFI	Haydon Fault Indicator	A.W. Haydon Co.		X		●		Yes	Unk.	Unk.	28; 83;
HJPA	Hybrid Job Performance Aid	BioTechnology/NPRDC	●					Yes	No	No	2;
HMA	Hybrid Maintenance Aid	NAVAIR	●					Yes	Unk.	Unk.	2;
HOLDOR II	Holographic Laser Document Retrieval System	Army Missile Command			●			Yes	Unk.	Unk.	83;
HOLO	Holography	Randomline, Inc.		?				Unk.	Unk.	Unk.	3; 83;
HTA	Hybrid Troubleshooting Aid	BioTechnology/NPRDC	?					Yes	Unk.	Unk.	2;
IA	Interpretive Aids	BioTechnology/NAVAIR	●				X	Yes	Unk.	Unk.	85; 86;
IBT	*Integrated Blocked Text*	*Sperry FSD*	●					Yes	Unk.	Unk.	45; 51; 12; 97
IET	*Imagery Enhancing Technique*	Imagetics, Inc.	?	?				Unk.	Unk.	Unk.	3; 24; 84;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data?	Field / Test Data?	Guideline / Spec?	NUMBERED NOTES
ILLUSTROMAT	Illustromat 1100	Perspective, Inc.			●			Yes	Unk.	Unk.	34; 83;
ILSDITS	ILS Digitized Information Transfer System	Hughes Aircraft Co.		●	X			Yes	No	No	83;
ILTM	Incidental Learning of Troubleshooting Methodology	BioTechnology/NAVAIR	●				X	Yes	Unk.	Unk.	85; 86;
IMC (1)	Integrated Maintenance Concept	Keltec/Navy BUSHIPS	●	X			X	Yes	Unk.	Unk.	13; 31; 97;
IMC (2)	Integrated Maintenance Chart	Keltec/Navy BUSHIPS	●					Yes	Yes	Yes	77; 78;
IMM	Integrated Maintenance Manual	Technical Operations, Inc.	●	X				Yes	Unk.	Unk.	13; 97;
IMP	Integrated Maintenance Package (or Plan)	Vitro Labs	X		●			Yes	Unk.	Unk.	34; 12; 85; 86;
IMPLODE	Implosion Technique	USAF	X	●			X	Yes	Yes	Unk.	85; 86;
IPB	Illustrated Parts Breakdown	(Various)	●					Yes	Unk.	Yes	93;
IRDS	Information Retrieval and Display System	(Unknown)		?				Unk.	Unk.	Unk.	3; 84;
IT	Integrated Test	Sperry FSD	●					Yes	Unk.	Unk.	12; 45; 85; 86;
ITDT	Integrated Technical Documentation and Training	Kinton/Army HEL & TRADOC	●				X	Yes	Some	Yes	35; 36; 57; 89; 97
JAAA	Job Aid Assessment Algorithm	NAVAIR & NC State Univ.	-	-	-	-	-	Yes	N/A	N/A	37; 82;
JGM	Job Guide Manual	USAF	●					Yes	Yes	Yes	5;
JGRA	Job Guide Repair Aids	Serendipity Assoc./USAF	●					Yes	Unk.	Unk.	5; 97;
JGTA	Job Guide Troubleshooting Aids	XYZYX Corp./USAF	●					Yes	Unk.	Unk.	5; 97;
JOB GUIDES	Job Guide Technical Order System	AFHRL	●					Yes	Yes	Yes	32; 15;
JOBTRAIN	(Unknown)	HumRRO/Army	●					Yes	Yes	Yes	15;
JPG	Job Performance Guide	Kinton/Army	●				X	Yes	Unk.	Yes	15; 35; 40; 97;
JPM	Job Performance Manual	Kinton/Army	●					Yes	Unk.	Yes	15; 35; 40; 97;
JTG	Job Task Guide	Army	?					No	Unk.	Unk.	3;
JTM	Job Task Manual	Army	?					No	Unk.	Unk.	3;
KINTEL	Kintel Closed Circuit TV	Kintel/NSIA		●				Yes	Unk.	Unk.	83;
LCI	Learner-Centered Instruction	ASA ?/AFHRL	X				●	Yes	Yes	Unk.	1; 63; 86;
LGCP	Lexical-Graphic Composer-Printer	Mergenthaler-CBS			●			Yes	Unk.	Unk.	34; 42; 12; 83,

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
LTS-1/LTS-2	Lincoln Training System	MIT Lincoln Labs					?	No	Unk.	Unk.	3; 84;
LTTA	Logic Tree Troubleshooting Aids	(Various)	●					Yes	Yes	Yes	
M3DD	Microfilmed Maintenance Manual Data Dissemination	3M Co.		X	●			Some	Unk.	Unk.	24; 83;
MADAR/GPS	Malfunction Detection Analysis & Recording (w/ Gnd. System)	Lockheed-Georgia		X		●		Yes	Unk.	Unk.	43; 83;
MAGNACARD	(Unknown)	Magnavox Corp.			●			Yes	Unk.	Unk.	24; 83;
MAGNAVUE	(Unknown)	Magnavox Corp.			●			Yes	Unk.	Unk.	24; 83;
MAINTRAIN	Maintenance & Training in Complex Systems	HumRRO/Army (Letterkenny)	●	X			X	Yes	Yes	Yes	80; 15;
MDC	Maintenance Dependency Chart	NAVSEA	●					Yes	Yes	Yes	
MDS	Maintenance Data System (Safeguard)	Western Electric Co./Army	X	X	●	X		Yes	Yes	Yes	24; 80; 15; 63;
MEDIA	Magnavox Electric Data Image Apparatus	Magnavox Corp./Bell Labs			●			Yes	Unk.	Unk.	24; 83;
MEMRI	Maintenance Engineering, Management & Repair Information	Republic Aviation	●	●	●			Yes	Unk.	Unk.	61; 62; 83; 85;
MIARS	Maintenance Information Automated Retrieval System	NAVAIR		●	●			Yes	Yes	Unk.	47; 63; 24; 83;
MICRO-III	Micro-III Portable Viewer	Microcard Reader Corp.						Yes	Unk.	Unk.	83;
MICROCARD	(Unknown)	Microcard Corp./NSIA			●			Yes	Unk.	Unk.	24; 83; 85;
MICROFICHE	(Unknown)	(Various)			●			Yes	Unk.	Unk.	24; 17;
MICROMS	Maintenance Information Concerning Repair & Operation of Missile Systems	AMC Redstone		●				Yes	Unk.	Unk.	64; 83;
MICROVUE	(Unknown)	Republic Aviation		●	X			Yes	Unk.	Unk.	61; 83;
MIM	Multi-Image Microfilm	Technical Operations			●			Yes	Unk.	Unk.	24; 83;
MINICARD	Minicard System	Recordak (Kodak)		X	●			Yes	Unk.	Unk.	24; 64; 83;
MINIDATA	(Unknown)	Martin-Marietta		X	●			Yes	Unk.	Unk.	24; 63; 83;
MINIMIC	Miniature Microviewers	Taylor-Merchant Corp.		●				Yes	Unk.	Unk.	83;
MIRACODE	Miracode System	Recordak (Kodak)			●			Yes	Unk.	Unk.	24; 83;
MIRAID	(Unknown)	Westinghouse		●				Yes	Unk.	Unk.	4; 83;
MIRM	Maintenance Instruction Recorded Magnetically	NAVSEA-NOL		X	●		X	Yes	Yes	Unk.	49; 63; 83;
MITIPAC	(Unknown)	NTEC						No	Unk.	Unk.	3; 84;
MMS	Maintenance Management System	Holm, Tait & Associates		X	●			Yes	Unk.	Unk.	14; 34; 65; 83;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
MOM	Maintenance on Microfilm	Eastern Airlines			?			No	Unk.	Unk.	3; 84; 94;
MRC	Maintenance Requirements Card	Navy	●					Some	Unk.	Yes	90; 97;
MODE	Maintenance Operations Documentation Enhancement	AT&T, Bell Labs	?		?			Some	Unk.	Unk.	62; 44; 12; 29; 84
MRS/SRM	Malfunction Reporting System/Specific Repair Methods	Boeing	?	?				Some	Unk.	Unk.	12; 3; 27; 84;
MSIM	Maintenance Support Information Manual	Air Force	●					Yes	Unk.	Yes	32; 50; 75;
MT	Maintenance Tips	Navy	-	-	-	-	-	No	No	No	39; 3; 82;
NAMES	Navy Aircraft Maintenance Evaluation System	NAVAIR						Unk.	Unk.	Unk.	3; 84;
NEOS	Neostylized Manuals	Army WECOM	●	X				Yes	Unk.	Unk.	66; 85; 91;
NEW LOOK	*New Look in Commercial Overhaul Manuals*	*Sperry FSD*	●					Yes	Unk.	Unk.	45; 12; 85; 86;
NICORD	(Unknown)	(Unknown)	?	-	-	-	?	No	Unk.	Unk.	3; 84;
NKT	Number - Keyed Text	(Unknown)	●					Yes	Yes	Yes	63; 92;
NTIPS	*Navy Technical Information Presentation System*	Hughes/NSRDC/NAVMAT	X	X	●			Yes	No	Yes	38; 63; 67; 82
NTMS	Navy Technical Manual System	Navy			●			Yes	Unk.	Unk.	67; 83;
OMMS	Organizational Maintenance Manual Set	USAF	●					Yes	Some	Yes	32; 52;
OPTICS	Optimum Procedure Task Instruction Compiler	Republic Aviation	●		X			Yes	Unk.	Unk.	61; 62; 85;
OP/WF	Optimum Picture/Word Format	H.P. Booher/NAVAIR	●					Some	Unk.	Unk.	17; 84;
ORTS	Operational Readiness *Test System*	RCA/NAVSEA				●		Yes	Unk.	Unk.	72; 83;
PABD	Precise Access Block Diagram	(Unknown)	●					Yes	Yes	Yes	87; 92;
PFC	Procedures Flow Chart	(Unknown)	?					No	Unk.	Unk.	3; 84;
PIMO	Presentation of Information for Maintenance & Operations	Serendipity/USAF	●					Yes	Yes	Yes	9; 63;
PIP	Programmed Individual Presentations	PIP Systems		●			X	Yes	Unk.	Unk.	12; 63; 83;
PLP	Pulsed Light Projection	Douglas Aircraft		●				Some	Unk.	Unk.	83;
PROFILE	Profile Cards	Philco Corp.	●	X				Yes	Unk.	Unk.	85;
PS	*PS Magazine*	*Army*	-	-	-	-	-	No	No	No	39; 82;
PYRAGRAMS	Pyramid Diagrams	Hughes Aircraft	●	X				Yes	Unk.	Unk.	54; 25;
QUIX	Quick Fix	McDonnell Aircraft						No	Unk.	Unk.	3; 84;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
RAPID	Radio and Press Information Dissemination	CIA ?			●			Some	Unk.	Unk.	33; 34; 83;
RAPIDS	Rapid Automated Problem Identification Data Systems	Grumman Aircraft	X	X	●			Yes	Yes	Unk.	24; 63; 83;
REPOM	Reliability Prediction Oriented Maintenance	NOL-NAVSEA	X	●			X	Yes	Yes	Unk.	48; 63; 83;
RESTORE	Rapid Evaluation System to Repair Equipment	Martin-Marietta	●					Yes	Unk.	Unk.	3; 84;
SADIE	Smith's Aural Diagnostic Inspection Equipment	British European Airways			?	?		No	Unk.	Unk.	3; 83;
SBD	Schematic Block Diagrams	(Various)	●					Yes	Yes	Yes	74; 58;
SCP/DLT	Symptom Cause Prompts/Decision Logic Tables	BioTechnology/NAVAIR	●					Yes	Unk.	Unk.	69; 85; 86;
SCP/SPT	Symptom-Cause Prompts/Symptom Pattern Tables	BioTechnology/NAVAIR	●					Yes	Unk.	Unk.	69, 85; 86;
SDM	Schematic Diagram Manual	USAF	●					Yes	Unk.	Yes	58; 52; 74;
SENSAID	(Unknown)	Westinghouse				●		Yes	Unk.	Unk.	4; 28, 83;
SHOCK ACTION	(Unknown)	HumRRO						No	Unk.	Unk.	3; 84;
SIMM	Symbolic Integrated Maintenance Manuals	Keltec; Westinghouse	●	X			X	Yes	Yes	Yes	13; 30; 56;
SIMS	Symbolic Integrated Maintenance System	Keltec/USCG	●	X			X	Yes	Yes	Unk.	13; 56;
SMMD	(Unknown)	NAVAIR ?						No	Unk.	Unk.	3; 84;
SPA	Skill Performance Aids	U.S. Army	●				●	Yes	Yes	Yes	89;
SPARES	Spares Test Capability Report	General Dynamics	●					Some	Unk.	Unk.	3; 84;
TAFI	Turn-Around Fault Isolation	McDonnell-Douglas	●					Yes	Yes	Unk.	25; 27; 12; 19; 86
TASKTEACH	(Unknown)	Rigney & Fromer					?	No	Unk.	Unk.	3; 84;
TDDD	3-D Dynamic Display	General Electric Co./ALC		●	X			Yes	Unk.	Unk.	18; 83;
TEAMAN	Teaching Manuals	(Unknown)	?				?	No	Unk.	Unk.	3; 84;
TEAMS	(Unknown)	Northrop Corp.						No	Unk.	Unk.	3; 84;
TICOH	Texas Instruments Computer (Handheld)	Texas Instruments		?	?	?		No	Unk.	Unk.	3; 84;
TMIS	Technician's Maintenance Information System	Hughes Aircraft		X	●			Yes	Unk.	No	24; 83; 88;
TMMP	Technical Manual Microform Program	NAVSEA		●				Yes	Unk.	Unk.	3; 83;
TOMS	Technical Order Microfilm System	USAF		●				Yes	Unk.	Unk.	3; 83;

JOB PERFORMANCE AIDS (JPA) CONCEPTS AND TECHNIQUES; SOURCES AND BASIC CHARACTERISTICS

SHORT TITLE*	TITLE / DESCRIPTION	SOURCE / SPONSOR	CHARACTER** Format	Media	Delivery	Diagnosis	Training	Descriptive Data ?	Field / Test Data ?	Guideline / Spec ?	NUMBERED NOTES
TOPP	Task-Oriented Plant Practices	AT&T; Bell Labs	●					Yes	Unk.	Unk.	62; 44; 12; 85; 86
TRACE	Transistor Radio Automatic Circuit Evaluator	Philco Corp.	X	●				Yes	Unk.	Unk.	12; 62; 71; 85;
TROLO	Trouble Locators	USAF	●					No	Some	Unk.	17; 84;
TRUMP	Technical Review & Update of Manuals & Publications	Information Int'l/NAVAIR			●			Yes	Unk.	Unk.	47; 83;
TSC	Troubleshooting Chart	Hughes	●					Yes	Yes	Yes	79; 78;
TSG	Troubleshooting Guide	USAF	●					Yes	Unk.	Unk.	41; 85;
TSM	Troubleshooting Manual	McDonnell-Douglas/NAVAIR	●					Yes	Unk.	Unk.	17; 85; 86;
TSP	(Unknown)	MIT Lincoln Labs						No	Unk.	Unk.	3; 84;
TT	Team Training	(Unknown)					?	No	Unk.	Unk.	3; 84;
USIPB	United States Illustrated Parts Breakdown	(Unknown)	●					Some	Unk.	Unk.	93; 85; 86;
VAST	Versatile Avionics Systems Test	NAVAIR				?		No	Unk.	Unk.	3; 84;
VATE	Versatile Automatic Test Equipment	Hughes Aircraft/USAF/SAMSO				●		Yes	Unk.	Yes	10; 83;
VIDEOFILE	Videofile System	Ampex Corp.		X	●			Yes	Unk.	Unk.	24; 83;
VIDEOSONIC	Videosonic System	Hughes; Wetherford		●			X	Yes	Unk.	Yes	63; 12; 15.
VIS	Visual Information System	Bell Labs	X	●		X		Yes	Yes	Unk.	8;
WALNUT	(Unknown)	IBM Corp.			●			Yes	Unk.	Unk.	24;
WDM	Wiring Diagrams Manual	USAF	●					Yes	Unk.	Yes	17; 21; 81;
WORKPAC	Work Package Concept	NAVAIR	●	X				Yes	Unk.	Yes	17;
WSMAC	Weapon System Maintenance Action Center	McDonnell-Douglas	X	X	●			Yes	Yes	Unk.	62; 63; 24; 55;
XFL	Experimental Fault Locator	Navy						No	Unk.	Unk.	3;

NUMBERED NOTES

1. The technique has been tested partially, not fully.
2. HJPA, HMA, and HTA are general terms for combining two or more aid types to accommodate different user experience levels. When applied to a specific technique, the terms usually refer to the AAT format.
3. Named in the literature; data not yet found/reviewed.
4. ADMIRE includes SENSAID (monitoring sensors) and MIRAID (display device).
5. AF FPJPA, C-141, FPJPA, JGM, JGRA, and JGTA are *probably all the same technique*.
6. Can be linked with MIRACODE.
7. Data can be transmitted via AUTOVON.
8. AIS and AIS are major *subsystems* of AAIS; they can be used independently or jointly, and can accommodate many different formats. Most significant characteristics are media and diagnostics.
9. AMSAS and PIMO are very similar; the development of AMSAS was based on PIMO.
10. General purpose automatic test equipment.
11. Can be linked with LGCP.
12. Method has been in use in industry/commercial operations.
13. BAMAGAT, FOMM, IMC, IMM, SIMM, and SIMS are essentially the same; BAMAGAT was the original method.
14. Fault isolation charts are computer-generated.
15. Preparation guidelines are not Mil-Spec.
16. BFIC, BIFAC, and BIFIC are nomenclature variations of the same technique.
17. Known to have been tested; data availability not confirmed.
18. Media includes a 3-D display.
19. Intended for use by experienced technicians.
20. System is specifically designed for revising and updating technical data.
21. Included for reference and comparison purposes.
22. DACOM (1) and DACOM (2) may be the same system with a different translation and source attributed to DACOM by one author.
23. Head-worn, portable device.
24. Storage and retrieval system.
25. FEFI and TAFI are two separate, but interrelated, techniques within FEFI/TAFI. FEFI is for in-flight use and TAFI is for the ground maintenance crew.
26. DIMATE and FIMATE are the Depot and Field versions, respectively, of the same system.

27. FEFI/TAFI, FIRM, and MRS/SRM are similar techniques.

28. Built In Test Equipment (BITE).

29. Dominant characteristic *not yet determined*.

30. FOMM is a new name given to the SIMM technique.

31. MDCs are part of *the* overall *method*.

32. AF JOB GUIDES include JGM, MSIM, GAM, WDM, LTTA, and possibly others. Equivalent to OMMS.

33. CAPT, ADPREPS, AUTOTEXT, TRUMP, and RAPID are closely related.

34. Data preparation system.

35. ITDT encompasses JPG and JPM, and ETM.

36. ITDT originally defined as Improved Technical Documentation & Training.

37. JAAA is a technique for assessing job aids for possible use; it is not a JPA. The technique may *be included in the Handbook, but not* as a candidate JPA.

38. Test program in progress; no data available yet.

39. A magazine (periodical), not a JPA technique.

40. Intended primarily for novice users.

41. TSG is possibly a forerunner of more recent innovative FPTAs.

42. Particularly for catalog data and computer printouts; potential application to narrative with graphics.

43. For use by flight engineers while in flight.

44. MODE was developed as an extension to TOPP.

45. IBT and IT were developed for commercial overhaul manual. Together they make up the NEW LOOK technique.

46. Reference 47 has suggestions for improving FPTAs.

47. MIARS and TRUMP are related.

48. REPOM used features from SIMM, PIMO, JPA, SBD/MDC, and ASMSA.

49. MIRM and REPOM are related.

50. MSIM provides *information* not included in a SGM.

51. Similar to SIMM.

52. OMMS includes GVM, GSM, JGM; FIM, WDM, and SDM. See descriptions of these.

53. OP/WF is similar to PIMO and JPA but uses graphics to show action.

54. The four levels in PYRAGRAM are the same as in *FORECAST* and *SIMMS and are similar to* PIMO *in intent*.

55. RAPIDS is similar to WSMAC and is related to MIARS.

56. Includes SBD and MDC.

57. Army New Look (ANL) is part of ITDT; applies to TM portion; more recent terminology is "User Oriented Technical Manual."

58. SDM seems to be related to SBD.

59. GVM and GAM are equivalent, but prepared to different specifications.

60. May *include both troubleshooting and non-troubleshooting* procedures.

61. MEMRI includes OPTICS and MICROVUE.

62. Proprietary interest claimed.

63. Compatible with many different formats.

64. Microfiche or microfilm reader/printer.

65. Can be used for *R & M* analyses, as well as for conduct of maintenance.

66. Primarily an operator's manual.

67. A TM acquisition and management system, not a JPA technique.

68. PIMO and JPA are the same method according to some authors.

69. Concept only according to most recent available data.

70. According to some authors, BAMAGAT means Block Assembly Maintenance & Group Assembly Troubleshooting.

71. Specifically for troubleshooting printed circuit boards.

72. AMPS was developed to supplement ORTS.

73. Specifications referencing Army "New Look" have been changed, deleting such reference.

74. Test data for SBD is probably applicable to SDM.

75. Conventional TM format.

76. See Note #2.

77. A component of the IMC (1) format technique.

78. This technique is an early version of MDC.

79. A component of the BAMAGAT format technique.

80. Possible clarifying publications on order.

81. The Wiring Diagrams Manual (WDM) is credited to the Air Force because it is a specific format in the USAF system. It is sometimes called a Wiring Data Manual. Army and Navy technical manuals also incorporate wiring diagrams.

82. Not a Handbook candidate: Not a job performance aid technique.

83. Not a Handbook candidate: No significant format-related characteristics.

84. Not a Handbook candidate: Insufficient descriptive data available.

85. Not a Handbook candidate: Insufficient field/test experimental data available.

86. Not a Handbook candidate: No preparation guidelines/specifications available.

87. BSDs and PABDs are used in FOMM technique.

88. ADDS utilizes features of TMIS, a predecessor prototype.

89. SPA is the most recent name for ITDT and ANL combined(?).

90. Status uncertain: Navy specs for MIPs & MRCs have been canceled.

91. NEOS has some similarities to ANL.

92. Test data and specifications for NKT, BSD, & PABD are for their use as part of the FOMM technique. No separate test data available.

93. USIPB and IPB are the same technique; GAFIPB differs from them primarily in its manner of preparation.

94. MOM is the term used by Eastern Airlines for the 3M Co. M3-DD technique.

95. Known to have been used and or tested by the military; no test or experience data available.

96. BFTA and DLPA are similar, except DLPA uses hybrid level.

97. The technique does not meet all criteria for inclusion in the Handbook, but may be included on the basis of equivalent characteristics.

SECTION 5. FORMAT TEST AND EVALUATION

5.1 INTRODUCTION

This section is intended to provide a comprehensive discussion of format test and evaluation programs and results, particularly with regard to the techniques that are described in AFHRL TR 80-50, Sections 4 and 5. The descriptions in those sections do provide summarized test information and data, generally sufficient to enable the TO Specialist to appreciate the merits and status of the method. This section will assist in achieving a more complete understanding of how claimed attributes and limitations were established, and how a particular JPA System, Primary Format, or Format fared when comparison evaluations were conducted.

5.2 EXPERIMENT AND TEST PROGRAMS

5.2.1 INCREASED REQUIREMENT FOR TESTING FORMATS. In the years when systems and technical manuals were simpler and less costly, and technicians needed less guidance, the adequacy of technical manuals was not a major area of concern. Whenever a new approach to technical data presentation was conceived, technical writers simply incorporated it into the manuals for the system or equipment. If the technique was not subjected to numerous complaints, it was considered successful. The measurable impact of the technique on performance and costs was insignificant, whether or not it was successful. As system equipment costs increased, however, and as personnel and maintenance costs began to claim a proportionately larger share of the system cost, it became apparent that a trial and error approach to improvement of technical information transfer was not realistic. Both researchers and program managers began to realize that new approaches should have a demonstrated *potential for improvement of something* before being introduced into actual technical manuals.

The insistence on "hard data" by the military services was well advised. New techniques were being prepared at a record pace and, according to their proponents, each would solve a multitude of problems inherent in the "traditional" manuals (*Refs. 11, 12, 13, 14, 82*). As shown in Section 4, however, relatively few of these innovations have yet been subjected to thorough test; fewer still have produced data which show unequivocal improvement in any significant area of concern.

5.2.2 COMPARATIVE EFFECTIVENESS. There have, however, been some well-conceived evaluations that have produced supportive "hard data." Mention has already been made of the PIMO, FORECAST, and BAMAGAT SIMM evaluations (see Section 3). Several survey reports are available (*Refs. 17, 58*) which present the results of various tests and evaluations of JPAs. Table 5-1 presents a summary of some of these tests.

In most cases the tests were conducted to compare the innovative technique to a comparable "Traditional Maintenance Manual" (TMM); in other cases the innovative technique was tested merely for its usability by maintenance technicians, with no comparative data being generated. Only one recent report (*Ref. 91*) is known which attempts to portray the comparative effectiveness of a variety of techniques based on the data from separately conducted tests. The result is a

Table 5-1.—Experimental Comparisons of Innovative Job Aids Versus Conventional Documentation (Ref. 17)

Concept	Year	Equipment	No. of Subjects	Results	Remarks
FORECAST	1958	Anti Aircraft Fire Control System	37	Equivalent performance	60% less training time
	1959	Anti Aircraft Fire Control System	16	40% improvement in performance. Stat. signif.	50% less training time
	1963	LORAN	98	Three times more faults identified. Stat. signif.	Same training time
JOBTRAIN	1962	Comm. Equip.	39	Equiv. performance	50% less training time
MAINTRAIN	1963	NIKE AJAX Radar	16	42% more malfunction found in 41% less time	10% level of confidence was used
SYMPTOM COLLEC TION Manuals	1964	HAWK Radar	84	80% vs. 40% isolation of faults. Stat. signif.	Experimental group was higher in aptitude
NIKE X MDS (A VIS)	1964	Target tracking radar	15	Programmed material superior to conventional. Visual-only mode 27% more effective. Programmed TM 19% more effective. Signif.	Results were a mixture of content and mode of presentation
SIMMS	1964	Radar	42	SIMMS gp. performed at 96%, controls at 70%	
	1971	SRC-20 Radio	178	Low trained grp. better with SIMMS high trained group better with conventional	Study was poorly designed and executed
BFIC	1966	Electronic Modules	80	Exper. group performed in 1/3 the time and made 1/5 the errors. Stat. signif.	High and low exper. and aptitude groups were matched
PIMO	1968	C141A	36	Apprentices performed non-trouble-shooting tasks error free. Experienced technicians did troubleshooting in 11% less time and with 1/5 the errors. Stat. signif.	Only experienced technicians did troubleshooting
Fully Proced. Trouble-shooting JPA's	1968	Maintenance Task	61	High School students performed similar to exper. technicians	Dubious assumptions made to justify performance
British Algorithm	1969	Nav. Equip.	5	Ave. diagnosis time fell from 90 to 31 minutes	No statistical treatment reported
Non-trouble shooting JPA's	1970	F-4J	52	Inexper. technicians using guides performed 30% better than exper. using manual. Stat. signif.	Exper. personnel also did better than guides
Fully Proced. JPA's Maintenance Dependency Charts	1971	UH-1H Helicopter	90	USAF technicians better with JPA's than TM's. Apprentices better with JPA's than experienced technicians were with TM's. MDC's were inferior to JPA's and TM's. VNAF experienced technicians performed equally well with all aids, apprentices did better with JPA, out-performing experienced technicians.	Study not published. No statistical significance indicated in summary. Original aids full of errors
SAFEGUARD MDS Phase four test	1972	Radar Return Generator	13	Technician performance not signif. diff. from test standards.	Procedure used to specify standards was questionable
Non-Trouble shooting JPA's	1972	Mobile electric power plant	26	Inexperienced made no more errors.	JPA's had to be validated before test could proceed

preference listing for the techniques compared for various areas of potential improvement. Table 5-2, adapted from *Reference 91*, identifies the techniques and data that were compared. Figure 5-1, extracted from *Reference 46**, presents the results of this comparison.

5.2.3 APPLICATION TO OPERATIONAL PROGRAMS. As the foregoing discussion illustrates, not all of the improved formats have been tested for effectiveness, and those which have been tested show significant differences in effectiveness. Furthermore, a particular format may be strong in some effectiveness areas and weak in others. Whether that format should be used in a given weapon system program depends on the factors that are most critical to *program* success, e.g., reduced training time, reduced performance time, error free performance, user acceptability, etc. This last parameter user acceptance has only rarely been tested in a way that provides the TO Manager with a reasonable basis for projecting the acceptability of a format to the personnel in the field who will be required to use it. As has been pointed out on many occasions, a format that is not acceptable to the technicians will find little use in operational programs, and will therefor be ineffective. One test program that did evaluate this factor was sponsored by AFHRL, comparing fully proceduralized troubleshooting aids (FPTA), logic tree troubleshooting aids (LTTA), and conventional TOs for the C-141 aircraft (*Refs. 19, 100***). In addition to evaluating the effectiveness of the aids, this study identified the factors that influenced the acceptability and usability of both the formats evaluated and technical manuals in general. The detailed results are discussed in paragraph 5.3.6, later in this section, along with those of a similar evaluation (*Refs. 3, 101*) conducted *after* implementation. The recommendations that emerged from these programs form the basis for the implementation program guidance in AFHRL TR 80-50, Part 7.5.

5.3 EVALUATION RESULTS

5.3.1 FPJPA VERSUS TMM: RESULTS OF COMPARATIVE R&D *(Refs. 94, 95, 96)*. In high school subjects with 12 hours of training using FPJPA, high-aptitude subjects (80th through 95th percentile) found 93 percent of troubles, while medium-aptitude subjects (50th through 65th percentile) found 80 percent of troubles. Air Force experienced subjects using TMM found 84.2 percent of troubles.

5.3.2 FPJPA AND SIMS VERSUS TMM: RESULTS OF COMPARATIVE R&D, PIMO *(Refs. 94, 90)*. Apprentices and experienced Air Force specialists (all high-aptitude subjects) performed non-TS tasks with no measurable errors when using FPJPAs. Both made errors using TOs. Apprentices could not complete many non-TS tasks using TOs. Experienced AF specialists reduced TS errors by 92 percent when using modified SIMS aids.

5.3.3 FPJPA AND FPTA VERSUS MDC VERSUS TMM: RESULTS OF UH-1H EVALUATION *(Refs. 94, 97)*. The major findings of the USAF portion of the evaluation were as follows:

**Reference 46* is the Executive Summary of the work reported in *Reference 91*.
***Reference 100* is a project summary brochure of the work reported in *Reference 19*.

Table 5.2. Comparison of Improved Formats and TMMs for Performance Effectiveness (Ref. 94)

Technology and/or Concept	Non-TS Tasks	TS Tasks	Requires ... Text Equipment ...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EPIPA	x	x	Yes	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Army New [illegible]	x	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible] FORECAST		x	Yes	[illegible]	[illegible]	[illegible]	[illegible]	1984	[illegible]	[illegible]	[illegible]
Enriched FORECAST	[illegible]	x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	
[illegible] [illegible]		x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible] [illegible]		x	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Enriched [illegible]		x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible] SIMS	[illegible]	x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
AF SIMS		x	[illegible]	[illegible]		[illegible]	[illegible]	1984	[illegible]	AF SIMS [illegible]	
[illegible] MM	[illegible]	x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
TMM	[illegible]	x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	

[illegible]

Comparative Effectiveness of Various IMG&I* for Highly Trained and/or Experienced Personnel

The comparative hard data produced by the various studies referenced in Table 2, indicate the following effectiveness relationships for IMG&I when used by highly trained and/or experienced personnel.

For non TS tasks

(1) FPJPA >> TMM

For TS tasks

(1) FPJPA > Enriched LTTA >> TMM

(2) Traditional FORECAST >> TMM

(3) AF SIMS >> TMM

Note: > More effective than

>> Much more effective than

The use of any of the indicated improved technologies in lieu of TMM would improve the efficiency of maintenance personnel. This improved efficiency would be reflected in reduced spare parts usage, shortened cross training on unfamiliar hardware and perhaps increased numbers of maintenance tasks performed.

IMG&I and Potential for Reducing Maintenance Personnel Costs

However, if LCC are to be greatly reduced, those technologies that maximize the utilization time and efficiency of first enlistment personnel must be fully exploited. This objective requires the application of those technologies which are not only effective for improving maintenance efficiency but also have potential for reducing entry training requirements. Table [illegible] indicates that [illegible] are available [illegible] meet both these [illegible] FPJPA, traditional FORECAST and [illegible] FORECAST. The hard data [illegible] relationships:

[illegible] TS tasks

[illegible] FPJPA [illegible] TMM

[illegible] TS tasks

[illegible] FPJPA [illegible] TMM

[illegible] Traditional FORECAST >> TMM

[illegible] there are hard data [illegible] had no experience [illegible] had received [illegible]

*IMG&I [illegible] Improved Maintenance Guidance and [illegible]

Currently, there are no hard data which indicate the relative effectiveness between FPJPA and FORECAST aids for reducing entry training requirements. However, an analyses of each technology or concept based on consideration of the developmental requirements including task identification and analyses products (TI&A), content and format indicates that the FPJPA technology requires the user to store and recall *less* guidance and information for task performance than the other technologies or concepts thus reducing the task training requirements for *entry, as well as experienced personnel.* ***Expressed in other terms, the FPJPA technology relegates more maintenance guidance and information to the "book" and less to the "head" than do other technologies or concepts.*** Compared on the basis of like analyses, the comparative potential of the applicable technologies for reducing entry training time and for increasing the maintenance efficiency of first enlistment personnel is indicated as follows:

For non TS tasks

FPJPA >> New Look

For TS tasks

FPJPA >> Enriched FORECAST ≈ Enriched LTTA

Note: ≈ of equivalent effectiveness.

(Enriched rather than traditional FORECAST aids are included in these statements. Enriched FORECAST aids relegate more to the "book" than the traditional variety.)

Based on the results of these analyses, Table 3 indicates combinations of technologies which would be effective for reduction of initial training time for first enlistment personnel. These are listed in the order of their potential for reducing initial training time as well as for increasing maintenance efficiency.

The indicated relative effectiveness for these combinations can be expressed as a formula [illegible]

[illegible]

Table 3. **Indicating Three Combinations of IMG&I Technologies as to Their Effectiveness for Reducing Initial Training Time**

Combination	Non TS Tasks	TS Tasks	Order of Effectiveness
[illegible]	FPJPA	FPJPA	[illegible]
[illegible]	FPJPA	Enriched FORECAST	[illegible]
[illegible]	FPJPA	Enriched LTTA	[illegible]

Figure 5-1. Comparative Effectiveness of Selected Format Techniques with Hard Data (Ref. 46)

a. The original UH-1H FPJPAs, both troubleshooting and non-troubleshooting, were virtually unusable, primarily because of many errors in the data. Satisfactory results were obtained with the USAF subjects only after making *Revision 3* of the non-troubleshooting FPJPA. The index to the JPA was not usable.

b. On eight non-troubleshooting tasks, experienced USAF personnel completed 88 percent of the tasks while using TM, and 92 percent while using *Revision 3* FPJPA. Corresponding data for USAF apprentices were 68 percent and 95 percent. For novices, the data were 33 percent and 61 percent. Thus, for non-troubleshooting tasks, using *Revision 3*, FPJPA improved the performance of all personnel. (Such improvements were not obtained when *Revisions 1* and *2* FPJPAs were used.) Apprentices using *Revision 3* FPJPA performed as well as experienced personnel using TM. Novices using FPJPA performed as well as apprentices using TM.

c. Only three troubleshooting tasks were used in the evaluation. Only after *Revision 3* of the troubleshooting FPJPA did any of the subjects perform better with the FPJPA than with the TM. During *Revision 3* of the troubleshooting evaluation, the troubleshooting trees were greatly modified. While using the TM, experienced USAF technicians successfully solved 83 percent of the problems and apprentices were successful on 61 percent of the problems. When using TM, novices successfully solved 44 percent of the troubleshooting problems. When using FPJPA, their performance increased to 100 percent for experienced and apprentice technicians, and to 56 percent for novice technicians. Again, FPJPA seemed to improve performance.

d. On the troubleshooting tasks, performance of USAF personnel using the MDC was inferior to performance with either FPJPA or TM.

e. Most USAF technicians seemed to like the FPJPA (*Revision 3*).

Revision 2 FPJPA was used throughout the Vietnamese National Air Force portion of the evaluation. All VNAF subjects had had specific "hands on" training on the UH-1H both the "experienced" and "apprentice" personnel. The major findings of the VNAF evaluation were:

a. On the non-troubleshooting tasks, experienced VNAF technicians performed equally well with TM or FPJPA. Perhaps because of recent training, VNAF apprentices performed somewhat better with FPJPA than did experienced VNAF technicians.

b. On the troubleshooting tasks, experienced VNAF technicians and apprentices performed quite well (80+ percent correct) regardless of the type of aid used (TM, FPJPA, or MDC). Vietnamese Air Force apprentices using FPJPA made no errors on the troubleshooting tasks. Using the TM and the MDC, they were successful on about 85 percent of the tests. The slight superiority of VNAF apprentices over VNAF experienced technicians is difficult to understand, but it may have been due to the recent job relevant training of the apprentices.

c. While the evaluations were being conducted in Vietnam, observations were made of VNAF training of UH-1H aircraft mechanics and the division of labor among technicians on the flight line. Effective "hands on" UH-1H training in the Vietnamese language was observed. The division of labor on the flight line was more specialized than had been envisioned when the FPJPA was planned.

5.3.4 FPJPA AND FPTA: RESULTS OF AF/FPJPA DEMONSTRATION *(Ref. 80).*

a. Following the 4-week training program, the trainees performed 14 maintenance problems. Ten problems involved troubleshooting, two involved removal and replacement of hardware, and two involved soldering. Three trainees from each aptitude group were randomly assigned to accomplish each problem. Any one problem was completed in one day to minimize the risk of compromising the tests. Two of the original 16 airmen were called away for administrative reasons and did not complete the program. The remaining 14 completed the program.

b. With an average of about 1.5 "assists" per troubleshooting problem, the airmen were able to solve the problems in average times (for various problems) ranging from 18 to 59 minutes. The 90 "assists" were needed because of reading errors (52), misuse of multimeter (20), lack of manual dexterity (6), misuse of oscilloscope (5), and miscellaneous errors (7).

c. On the troubleshooting tasks, the high-aptitude trainees scored consistently better than the medium-aptitude trainees in both time and number of assists; however, neither of these differences was statistically significant. The high-aptitude group was able to complete 10 of 30 problems without an assist, while the medium-aptitude group completed only two problems without an assist.

d. The groups performed comparably on the remove and replace tasks. They proceeded smoothly and, with one exception, without error.

e. In the soldering tasks, the medium-aptitude subjects were slower but their products were of higher quality than those of the high-aptitude group.

f. In general, the presence of the high-ranking observers seemed to disturb and slow the performance of the airmen.

5.3.5 FPTA VERSUS LTTA VERSUS TMM: RESULTS OF COMPARATIVE R&D (HIGH-APTITUDE SUBJECTS ONLY) *(Refs. 19, 94, 100).* This study generated comparative data concerning FPTAs, enriched LTTAs, and traditional maintenance manuals (TMM) (called Technical Orders (TO) by the Air Force). The detailed results are reported in AFHRL-TR-76-74(I) *(Ref. 19).* Table 5-3 indicates success in terms of percentage of troubles, identified by each experience level using each type of maintenance data. All of the subjects of this study had high electronics aptitudes (80th percentile and above).

Table 5-3.–Comparison of FPTA, LTTA, and TO in Terms of Percentage of Troubles Found (Refs. 19, 94)

Experience of Subjects	Maintenance Level	Type of Data: FPTA O	FPTA I	LTTA O	LTTA I**	TO O	TO I
Inexperienced	Organizational (O)	88.9		77.8		*	
	Intermediate (I)		88.8		60.6		*
Through 6 months	O	100		100		100	
	I		95.4		89.4		60.6
Over 6 months	O	95.8		95.8		100	
	I		95.4		87.8		78.8

*No data collected.
**I level LTTA did not contain location pictorials.

Table 5-4 indicates the excessive number of spare parts utilized in the process of finding these faults. These data are expressed in terms of the average number of unnecessary spare parts used per trouble. In this table the results for the two experienced groups are combined.

Table 5-4.—Comparison of FPTA, LTTA, and TO in Terms of Spare Parts Used (Refs. 19, 94)

Experience of Subjects	Maintenance Level	Types of Data: FPTA O	FPTA I	LTTA O	LTTA I	TO O	TO I
Inexperienced	O	.77		1.00			
	I		1.44		2.22		
Experience	O	.13		.25		.53	
	I		1.03		.94		1.86

Table 5-5 indicates the developmental cost in dollars of the FPTA and LTTA for both O and I maintenance for the AN/APN-147 and AN/ASN-35. The FPTA was more expensive to develop than the LTTA. (It should be recalled that the LTTA for I maintenance did not contain pictorial locators which, if added, would no doubt have increased the cost.)

Table 5-5.—Comparison of Cost Experienced in Dollars for the Development of FPTA and LTTA for the AN/APN-147 and AN/ASN-35 (Refs. 19, 94)

Maintenance Level	FPTA	LTTA	Difference
Organization (O)	14,451	7,593	6,858
Intermediate (I)	164,680	111,076	53,604
Total	179,131	118,669	60,462

When the results presented in these three tables are considered in terms of what type of troubleshooting aids are more effective *for the type of experienced personnel now assigned to the Air Force*, one can easily conclude that the LTTA is the most cost effective in terms of TO development dollars.

a. At the O level of maintenance, experienced personnel did quite well with TO, LTTA, and FPTA.

b. At the I level, both LTTA and FPTA were far superior to TO.

c. At the I level, FPTA was somewhat more effective than LTTA in terms of troubles found. An in terms of unnecessary spare parts used, both were about the same, with the slight difference favoring LTTA. But in terms of cost, the FPTA was $53,604 (or 48%) more costly to develop.

At least for the present, the Air Force Logistics Command (AFLC) technical data establishment has decided in favor of the LTTA. *But such decisions must be based on tacit assumptions that the personnel using these aids will always have the high aptitudes, the long training times, and the substantial experience advantages now enjoyed by the Air Force.*

However, when the results presented in these tables, together with other available data, are considered in terms of potential for more effective utilization of first enlistment personnel, *one can conclude that a large amount of the potential for effecting substantial future personnel savings may have been lost by the decision in favor of LTTA.* The following results obtained from inexperienced personnel indicate that such personnel performed much better with FPTA.

a. Inexperienced subjects found more O and I level troubles when using FPTA than when using LTTA: at the O level, 11.1 percent more (88.9% vs. 77.8%), and at the I level, 28.2 percent *more* (88.8% vs. 60.6%).

b. Inexperienced subjects used fewer unnecessary spare parts per trouble when using FPTA than when using LTTA for both levels of maintenance, i.e., .23 more at the O level and .78 more at the I level.

These data would indicate that by using FPTA the Air Force could get immediate utilization of newly assigned personnel either from school or from assignments on other hardware. This would greatly reduce the requirement for expensive on-the-job training (OJT) or cross-training. It would also provide a more rapid buildup potential in case of national emergencies. When viewed from the potential savings in personnel costs and potential for rapid personnel buildup points of view, the relatively small *immediate* savings of $58,207 (from Table 5-5, $118,669-$60,462) could be very expensive in the long run. Also, the use of LTTA in lieu of FPTA could greatly reduce the potential savings from well designed FPJPA/task oriented training trade-offs.

A previous exploratory development study indicated that inexperienced, average-aptitude subjects using FPTA found about 10 percent fewer troubles on the first attempt than did high-aptitude subjects. Projecting this difference onto the data presented in Table 5-3, one could expect average-aptitude subjects to find about 80 percent of the troubles using FPJPA for both O and I levels. If FPJPA were developed for average-aptitude subjects as the target population, this percentage could probably be increased. In any case, FPTA would be more effective than LTTA, for maximum utilization of average-aptitude (40th to 70th percentile) personnel.

Additional detail of the foregoing study is provided as follows:

- Apprentice technicians (FPTA vs. LTTA)

  a. *Proportion of Problems Solved* (see Table 5-3). Apprentice technicians were able to successfully solve 88.9 percent of the organizational level problems with the FPTAs and 77.8 percent with the LTTAs. They were able to isolate 88.8 percent of the faults using FPTAs and 60 percent of the faults using LTTAs for the intermediate level problems. It is noteworthy that the apprentice technicians were able to solve a relatively large proportion of the problems, considering the fact that they are not expected to be able to troubleshoot at this stage of their careers.

b. *Number of Parts Used* (see Table 5-4). Fewer "good" parts were incorrectly replaced when FPTAs were used than when LTTAs were used. However, the difference was not statistically significant.

c. *Time to Troubleshoot.* There was very little difference in the times required to troubleshoot using FPTAs and LTTAs.

- Six months or less experience (FPTA vs. LTTA vs. TO)

a. *Proportion of Problems Solved* (see Table 5-3). Technicians with less than six months experience were able to successfully isolate all of the problems at the organizational level, regardless of the type of data used. However, for the intermediate level the results were somewhat different. These technicians were able to isolate 95.4 percent and 89.4 percent of the problems with FPTAs and LTTAs, respectively. Performance with the TO was significantly poorer, with only 60.6 percent of the problems solved.

b. *Number of Parts Used* (see Table 5-4). Significantly fewer "good" parts were incorrectly replaced when FPTAs (0.38) or LTTAs (0.69) were used than when TOs (1.58) were used.

c. *Time to Troubleshoot.* Troubleshooting performance was significantly faster at the organizational level with the TO (16 minutes) than with either the FPTA (30.4 minutes) or LTTA (28.4 minutes). However, this finding is reversed for the intermediate level, where the use of FPTAs (30.8 minutes) or LTTAs (34.8 minutes) resulted in significantly faster performance than the use of TOs (59.9 minutes).

- More than six months experience (FPTA vs. LTTA vs. TO)

a. *Proportion of Problems Solved* (see Table 5-3). The proportion of problems solved by the more experienced technicians was essentially the same as the performance of the technicians with less than six months experience, the only exception being that the more experienced technicians performed better with the TO than did the less experienced technicians. At the organizational level the percentages were 95.8 percent for both FPTA and LTTA and 100 percent for TOs. At the intermediate level the proportions were 95.4 percent (FPTA), 87.8 percent (LTTA), and 78.8 percent (TO).

b. *Number of Parts Used* (see Table 5-4). The number of parts used by the more experienced technicians was essentially the same as for the less experienced group. For the combined maintenance levels the mean parts utilization was 0.76 (FPTA), 0.61 (LTTA), and 0.78 (TO).

c. *Time to Troubleshoot.* Significant differences in times were found for FPTAs, LTTAs, and TOs. The difference is in favor of the TO for organizational level troubleshooting problems and in favor of the FPTA and LTTA for intermediate level problems. The mean times in minutes at the organizational level were 37.1 (FPTA), 30.2 (LTTA), and 20.9 (TO). At the intermediate level the times, in minutes, were 35.2 (FPTA), 39.4 (LTTA), and 46.7 (TO).

- Attitudes toward data types

Questionnaires were used to measure the attitudes of the technicians toward each type of data. FPTAs were preferred by all subjects for all levels of maintenance. LTTAs were the second

choice of all subjects for all types of maintenance. For experienced personnel the TO was the least preferred type of technical data. Ratings of the TO for intermediate level maintenance were especially low. Apprentice technicians did not use, and were not questioned about, TOs.

5.3.6 JOB GUIDES, FPTA, LTTA, AND TO: RESULTS OF JOB GUIDE SURVEY ON USER ACCEPTANCE AND USABILITY ***(Refs. 3, 19, 100, 101).*** As part of its technical order improvement program, the Air Force recently procured an improved system of technical data for maintenance of the C-141 aircraft. In an experimental program (*Refs. 19, 100*) conducted prior to the procurement decision, an initial assessment of the level of acceptability of FPTAs, LTTAs, and TOs was made, the results of which are illustrated in Figure 5-2.

A similar evaluation was conducted, at a later date, when Job Guide Manuals (JGM) and Logic Tree Troubleshooting Aids (LTTA) were implemented for the C-141 (*Refs. 3, 101*). The data included Job Guide Manuals (JGM), Logic Tree Troubleshooting Aids (LTTA), and supporting data* on a large-scale, operational basis. It had been established that the use of JGMs and LTTAs could improve maintenance efficiency (*Refs. 19, 90*). However, it was not known how well the new proceduralized data would be accepted by the users or what problems would be encountered in implementing and using the data in an operational environment. The study described in these reports was designed to obtain answers to these questions. Whereas the prior study was an experimental evaluation, this study was to determine the acceptability and usefulness of the aids to the personnel who used them *after* implementation.

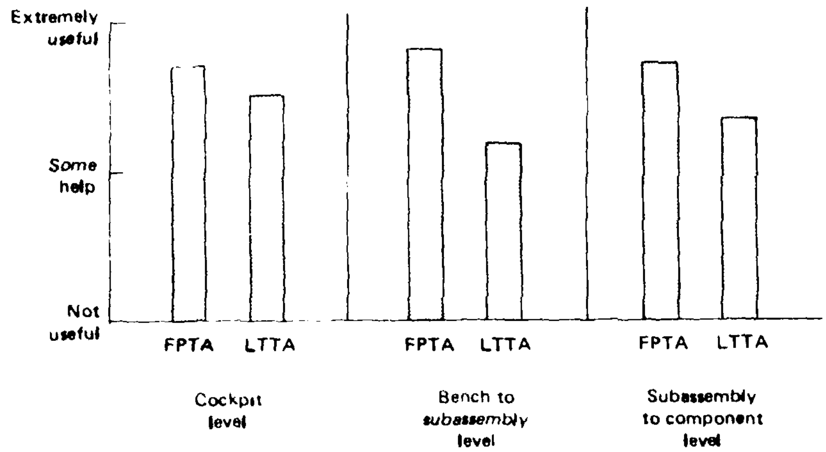
The C-141 job guide TOs were procured by the AFLC as part of its Technical Order Improvement Program. The data were produced under contract by Westinghouse Corporation in accordance with a modified version of MIL-M-38800A. The military specification, MIL-M-38800A, was modified by the addition of the requirement for a task analysis. This requirement was included to insure that all tasks were identified and that the procedures developed were accurate and effective. The requirement was included at the request of the using command, Military Airlift Command (MAC), with the concurrence of the procuring agency, Warner Robins Air Logistics Center, Georgia.

Other features of the job guide contract included a warranty on the data, complete contractor access to the aircraft, and 100 percent "hands-on" validation and verification of the data. It is felt that these features, together with a thorough task analysis, had a positive influence on the quality of the data procured.

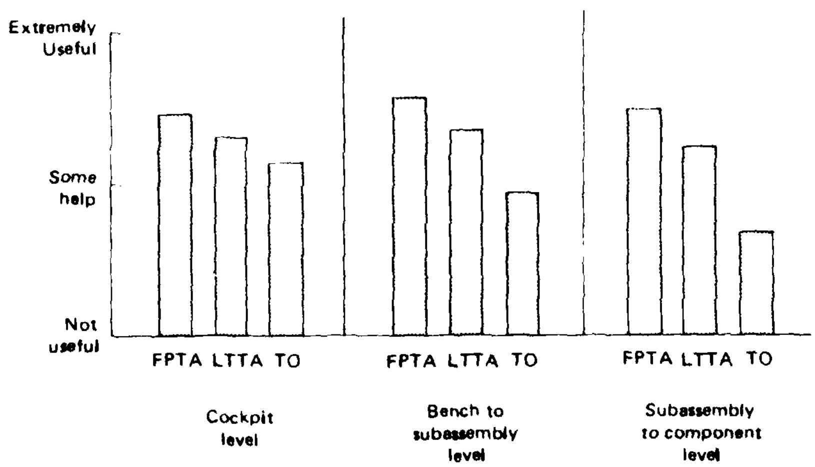
In addition to a task analysis, contractor access to the equipment, and 100 percent "hands-on" verification and validation, AFHRL believes that a trade-off between training and the job guide coverage and a user assessment process add significantly to the completeness and accuracy of the data. Recommended procedures may be found in *Reference 20*.

Approach: Interviews, observation, and questionnaires were used to evaluate the acceptance and usability of the new technical data. Data were collected in three phases, before implementation of the new data, shortly after implementation, and approximately 6 to 8 months after implementation. In Phase I (approximately 3 months before implementation), interviews, observation, and a short questionnaire were used to obtain a measure of the attitudes of technicians toward the use of

*Maintenance Support Information Manual (MSIM), General Aircraft Manuals (GAM), and Wiring Diagram Manuals (WDM).



a. Opinions expressed by apprentice technicians about the usefulness of FPTA or LTTA as a troubleshooting aid.



b. Opinions expressed by experienced technicians about the usefulness of FPTA, LTTA, or TO as a troubleshooting aid.

Figure 5-2.—Results of Comparative Evaluation of the Perceived Usefulness of Three Troubleshooting Aids (Ref. 100)

proceduralized technical data and how well they expected to like using the JGMs and LTTAs. In Phase II (6 to 8 weeks after implementation), observations and interviews were used to identify problems encountered in the implementation of the data and to obtain an indication of initial attitudes toward use of the new technical data. In Phase III (6 to 8 months after implementation), interviews, observation, and a 37-item questionnaire were used to measure user attitudes toward the data and to evaluate progress in overcoming problems encountered in the implementation of the data.

Results: The results of the interviews, observations, and questionnaires indicated that the program was successful. The JGMs and LTTAs were generally well accepted, although some resistance to change was encountered. The new technical data were generally considered to be superior to the Technical Orders that they replaced. Table 5-6 presents some examples of responses to the questionnaire.

Several factors were identified that had either a positive or a negative effect on the acceptability and usability of the data. Factors that had a positive effect on acceptance and usability included: size of the JGMs, clarity of the instruction, organization of materials, use of illustrations, and dual-level presentation of instructions. Negative factors affecting acceptance and usability included: resistance to change, errors in the data, requirements to use more than one volume for some jobs, inadequate provisions for storing the data, easily torn pages, difficulty in locating procedures, and implementation problems.

A number of problems were encountered in implementing the data, resulting in a negative impact on the acceptance of the data. These problems resulted primarily from poor communication regarding when and how the data are to be used and inadequate training in how to use the data.

Recommendations: The following recommendations were made for consideration by Air Force and other DOD agencies when job guide-type technical data are being procured.

a. A thorough task analysis should be accomplished to provide the data base for the development of the technical data.
b. The contractor developing the data should be given free access to the subject equipment throughout the development process.
c. A thorough verification of the data should be accomplished.
d. Consideration should be given to use of the dual-level approach for presenting instructions.
e. More durable paper and binders should be used.
f. Training should be provided for all users on the use of the data.
g. A comprehensive implementation plan should be developed and utilized to insure a smooth introduction of the data.
h. Special provisions should be made to insure rapid correction of errors in the data.

5.3.7 FPJPA AND TASK-ORIENTED TRAINING: SUMMARY OF NAVAL AIR DEVELOPMENT CENTER (NADC) FPJPA/TOT TRADE-OFF STUDY *(Refs. 94, 99).*

a. FPJPAs for organizational (O) and intermediate (I) level maintenance (TS & NTS) of the AN/AQA-7 Sonar Recorder Group, as well as matching TOT packages (one for O level technicians and one for I level technicians), were developed, and hard data as to their effectiveness were obtained.

Table 5-6.—Percentage of Subject Responses, by Base and by Squadron, to Sample of Questions on the Job Guide Questionnaire (Ref. 3)*

Questions	Base			Squadron		
	CAFB	NAFB	Both	AMS	FMS	OMS
1. How do you like the Job Guide Manuals?						
a. Completely satisfactory	11.1	8.1	9.6	5.9	8.3	14.3
b. Good, but could be improved	68.0	70.2	69.1	70.3	77.8	59.1
c. Satisfactory, but no better than the old TOs	15.7	13.7	14.7	15.8	8.3	20.0
d. Unsatisfactory	4.6	6.8	5.7	7.9	3.7	5.7
e. Other, or multiple response	0.0	0.6	0.3	0.0	0.9	0.0
f. No response	0.7	0.6	0.6	0.0	0.9	1.0
12. Would you prefer to use						
a. Traditional-style TOs	21.6	18.6	20.1	20.8	22.2	17.1
b. Job Guide-style TOs	58.8	48.5	53.5	43.6	64.8	51.4
c. Checklists	12.4	22.4	17.5	22.8	7.4	22.9
d. No TOs	6.5	5.6	6.1	6.9	5.6	5.7
e. Other, or multiple response	0.7	4.4	2.6	5.0	0.0	2.9
f. No response	0.0	0.6	C.3	1.0	0.0	0.0
18. As a source of information for your job, the new Job Guide Manuals are:						
a. Much better than the old TOs	16.3	11.8	14.0	9.9	14.8	17.1
b. Better than the old TOs, but can be refined	53.6	57.1	55.4	57.4	59.3	49.5
c. No better than the old TOs	18.3	18.6	18.5	16.8	15.7	22.9
d. Worse than the old TOs	10.5	11.8	11.2	15.8	8.3	9.5
e. Other, or multiple response	0.7	0.0	0.3	0.0	0.9	0.0
f. No response	0.7	0.6	0.6	0.0	0.9	1.0
25. The new JGMs and LTTAs help you do your job?						
a. Better	47.1	45.3	46.2	47.5	49.1	41.9
b. About the same	46.4	48.5	47.5	43.6	44.4	54.3
c. Not as well	4.6	5.0	4.8	8.9	3.7	1.9
d. Other, or multiple response	0.0	0.0	0.0	0.0	0.0	0.0
e. No response	2.0	1.2	1.6	0.0	2.8	1.9
33. Do you prefer to:						
a. Use LTTAs for all troubleshooting tasks	15.5	22.7	19.2	14.9	21.3	28.0
b. Use LTTAs for infrequent troubleshooting tasks only	28.2	26.7	27.4	27.0	31.9	20.0
c. Use LTTAs for the most difficult troubleshooting tasks only	32.4	34.7	33.6	29.7	36.2	40.0
d. Develop own troubleshooting strategy and not use LTTAs at all	22.5	13.3	17.8	25.7	8.5	12.0
e. Other, or multiple response	1.4	2.7	2.1	2.7	2.1	0.0

*These are examples only; see *Reference 3* for responses to all of the questions.

b. For those subjects assigned to organizational maintenance, a 13-week TOT package was developed to prepare average aptitude personnel (approximately 40th to 50th percentile) to perform O level maintenance on the AN/AQA-7 Sonar Recorder Group of the S2-G aircraft using FPJPA. A 16-week TOT package was developed to prepare the same range of average aptitude personnel to perform I level maintenance tasks on the same equipment using FPJPA.

c. Traditionally, the AN/AQA *System* has been maintained by "A" school graduates using TMM. The entry aptitude for "A" school is 84th percentile and above. The appropriate "A" school program was 22 weeks in length and was theory based. Students selected for O level maintenance received 2 additional weeks of AN/AQA specific training, making a total of 24 weeks. Students selected for I level maintenance received 14 additional weeks of system specific training, making a total of 36 weeks. So the TOT package for O level training was 11 weeks shorter than conventional training (a 46% savings in training time) and the I level package was 20 weeks shorter than conventional training (a 56% savings in training time).

d. The evaluation of the subjects sought to provide a realistic and practicable work setting with representative maintenance problems. Since the data collection had to be accomplished in 4 weeks, only five problems could be scheduled for each O level subject and only four for each I level subject. However, the problems selected are considered representative. The results are depicted in Table 5-7.

Table 5-7. Task Success of Medium Aptitude Subjects (40th-50th Percentile) Using FPJPA (Refs. 94, 99)

Levels of Maintenance	Problem Identification	Non-TS	TS	Percent of Problems Successfully Completed
O Level Problems: (12 subjects)	19A2		X	90.5
	20A-1		X	91.1
	1A1		X	97.1
	4A2		X	57.5[a]
	FMS #2		X	97.0
Composite of O level:				86.6
I Level Problems: (23 subjects)	6A4	X	X	84.4
	PP6306		X	93.7
	4A2	X (Align)		68.2[a]
	11A3	X (Align)		82.5
Composite of I Level				82.5
Composite of O and I Levels				84.1

[a]Problem required each subject to use the dual beam feature of the oscilloscope. Subjects had received no training concerning this feature of the scope

These results are only slightly lower than those reported for the AFHRL advanced development study by Potter and Thomas (*Ref. 19*), which considered only troubleshooting problems, and where the inexperienced subjects isolated 89 percent of both O and I level troubles. It should be noted that the Potter and Thomas study utilized high-aptitude subjects (80th percentile and above) who had completed 36 weeks of conventional theory-based training, whereas this study utilized only average-aptitude subjects.

e. The subjects of this study, as well as those in the Potter and Thomas study (*Ref. 19*) and the Altus demonstration (*Ref. 80*), displayed weaknesses in their ability to use key test equipment, especially the oscilloscope. The percentages of troubles successfully found, although impressive, would no doubt have been higher if subjects had possessed high proficiency in the use of their test equipment. (There is also substantial evidence that this is a co[illegible] weakness of many DOD experienced maintenance technicians (*Ref. 107*).)

Such lack of test equipment proficiency indicates that the subjects had received insufficient "hands on" practice in the use of appropriate test equipment functions. In the Altus effort (*Ref. 80*), this weakness was attributed to a lack of sufficient practice frames in the training package. As a result, the Altus report recommended that future TOT packages contain more practice frames. Since the TOT packages for this study arrived late, most subjects had insufficient time for completing their TOT packages. It can be assumed that subjects would have successfully completed even more tasks if they could have had the full advantage of their TOT packages.

However, one important omission was found in both the O and I level TOT packages. No training was provided on the dual trace function of the oscilloscope. The relatively low percentages of successful completions for the O level task 4A2 and the I level task 4A2 (Table 5-7) were the direct result of these inadvertent omissions.

f. This project did demonstrate that combining the FPJPA and TOT technologies was feasible and that such a trade-off would reduce initial training time for first-term maintenance personnel. In spite of all the difficulties previously mentioned, the performances of the medium-aptitude subjects of this study were impressive. Their performances were as good or better than those of high-aptitude, conventionally trained subjects in other studies. All of the difficulties mentioned are correctable, and their correction would result in still higher levels of performance.

5.3.8 EXPERIMENTS AND TESTS OF SPA. As with many of the other format-based techniques, pinpointing hard data that show the effectiveness of SPA formats is difficult because it is a system in the process of evolving from formats with one set of characteristics to formats with other characteristics. In its own most recent assessment report (*Ref. 111*), the Army projects the benefits of SPA from the conduct of evaluations of FPJPA (and other) formats in Air Force and Navy programs, most of which occurred during the 1960s and early 1970s.

1. A literature search indicates that results from studies and tests sponsored by DOD and all three military services overwhelmingly support the need for Skill Performance Aids techniques to provide accurate, easy to understand, and readily useable technical information to service personnel for the operation and maintenance of military equipment.

The considerable data collected over the past 20 years suggest that the performance of lesser-trained and lesser-skilled individuals can be enhanced through skill performance aids materials with a consequent reduction of training time and costs, and a reduction in maintenance costs. The positive benefits available indicate the need to continue in the direction of developing and using Skill Performance Aids type of data presentation. (*Ref. 111*)

The assessment then itemizes quantitative effectiveness data resulting–primarily–from Air Force Job Guide tests (*Refs. 107, 17, 114*). The Army bases its estimates of SPA effectiveness on those tests and on "observations of validation and verification trials [which] indicate similar expected benefits" (*Ref. 111*). Actually, Army-sponsored evaluations of SPA-type formats have been conducted. The earliest (conducted in 1970) was for the "New Look" manuals for the M60 Machine Gun; it gave the following results:

- The initial test was of the "pocket-sized" M60 manual, and was conducted at the Army's Infantry School.

  The guidelines were very basic, "Common Sense." Two-color printing was allowed and a fully illustrated format was encouraged. Let's look at the result. First, we presented all information necessary to the operator in straight forward [sic] language. We avoided referencing from one page to another. Each topic was collected into logical double page spreads, or "Modules of Information." The emphasis was upon visual information integrated with supporting text. This approach led naturally to the pocket size horizontal format, shown here. The second color emphasizes warnings, adds clarity, aids readability, and helps attract and hold reader interest . . . .

  We included a post-paid reply card asking the operator how he liked the new style manual [sic]. The response was phenomenal, about 97% favorable. We even received letters from members of other services asking, "Why can't all military publications be like this new M60 TM?" (*Ref. 67*)

Subsequently, a similar manual (for a crew-served artillery piece) was prepared in a "logbook" size and tested at the Field Artillery School.

> Again we included a reply card in the test version printed in 1973. And, again, acceptance was phenomenal. The demand for this new log book size graphic operator's manual was so great that a second draft edition was printed. This edition included comments received from the test of the first draft. The official DA version was printed and distributed in 1974. (*Ref. 67*)

These results do not, of course, represent the "hard data" necessary to properly evaluate effectiveness, but they are indicative of the acceptance of the innovative formats by using personnel.

In subsequent tests (1978), an evaluation of two manuals prepared according to the principles of MIL-M-63036 and MIL-M-63038 was conducted:

The manual was written to suit soldiers ranging in experience from recent Advanced Individual Training (AIT) graduates through an experienced Section Chief (Non Commissioned Officer). The manual was intended to require the Section Chief to provide guidance, based upon his training and experience, in performing any complex or critical task. The results: "The new operator's manual represents a good approach to the packaging of technical documentation. Crew members can successfully use the new manual under the supervision of a Section Chief." (4)

Each task in the manual was tried at least twice. Some complex tasks were selected for additional trial. The evaluation was so severe, so "nit picky" in fact, that a large number of previously unnoticed editorial errors were found (misspelled words, misplaced commas, mis-references). Also, some tasks did not contain enough detail to allow the soldiers to complete without supervisory assistance. All of these defects were corrected before printing and field distribution.

Soldier attitude information was obtained by use of a TRADOC questionnaire answered by all soldier participants after the hands on trial concluded. Here are those results.

TM Rating.

"How do you rate this TM?"

Very good	7
Good	13
OK	1
Poor	1
Very poor	0
	22

Ease of Use.

All soldiers said that the manual was easy to use.

Comparison to Previous Edition.

88% said that this TM was better than the 1974 version it will replace. That version was the first log book size "New Look" TM ever produced. And it in turn was light years ahead of the old TM it replaced.

Assistance Required.

88% said they could have performed most of the TM tasks without any help from the Section Chief.

Confidence in TM.

Finally, when asked whether they would trust their Section Chief *or* the manual if they had a problem, here's what they said:

Section Chief	25%	
Manual	38%	67%
Both	29%	
No answer	8%	

While this is still "acceptability" as opposed to "effectiveness" data, it is considerably more definitive. According to the Army's SPA Assessment Team (*Ref. 111*), effectiveness oriented tests of TMs for the M60A1 Tank Turret and three types of wheeled vehicles are currently underway.

SECTION 6. FORMAT OPTION SELECTION DATA

6.1 INTRODUCTION

AFHRL-TR-80-50 — Section 6 — provides guidelines to assist the TO Manager or Specialist in selecting a particular IPA System, or some combination of format-based techniques, for a particular program. The purpose of this section in AFHRL-TR-80-51 is to provide additional background material about research in format selection and proposed format selection methods as well as additional details and amplifying data to support the guidelines suggested in AFHRL-TR-80-50.

6.2 RESEARCH BACKGROUND

The search for methods to use for selecting the "right" format has been going on almost as long as the research on the formats themselves. Historically, a standard, "conventional" technical manual* was procured for all systems, even though conditions of TO use and technical information needs are not the same in all systems. The standard approach was and is popular because of the efficiencies achieved in the production portion of the manual life cycle, such as minimum development costs and relatively consistent products from a large number of vendors (*Ref. 27*). Yet the newer innovative formats were being developed to compensate for some of the usability problems that the standard TMs were causing.

As the new formats began to be used in programs, the tendency was to try to acquire them in much the same manner as standard TMs were procured. Place the specification of these once in the procurement document and obtain "World's Best Format (WBF)" technical manuals for all systems and equipments. In some systems, the selection proved successful; in others, disastrous. In some systems, some problems of using standard technical manuals were resolved. In other systems the standard manual would have been preferable to the "WBF," but "WBF" had become the new standard manual. Just as each branch of the military services had its "standard" manual, each was now standardizing its own version of "WBF." It became apparent to many researchers that there was no "best" format to satisfy the needs of all systems, under all conditions.

One response to this realization was to make a particular IPA System more flexible in its ability to meet the needs of a particular system. Thus, we see alternative formats available in a IPA System, such as the troubleshooting data options in JG-TOS, and the packaging options in FOMM (see Volume I, Section 4).

Another type of response was to increase the usability of the data by permitting more flexibility to the user. This is seen in the dual level, or hybrid, formats that are part of JG-TOS, FOMM, AAT, and some other techniques. This approach presents the data in *both* a highly directive and less

---

*The literature on procedures for the conduct of operations or maintenance activities often refers to Technical Manual, or TM, as a standard term for a manual containing such procedures. While this is essentially correct for Army and Navy procedures, in the Air Force the correct terminology is "Technical Order (TO)." In USAF parlance, a Technical Manual (TM) is but one type of TO (see Glossary).

directive (sometimes purely deductive) manner and allows maintenance personnel to use the mode that best matches their knowledge, training, and experience, or one that is merely preferred by them. Still another approach has been to "enrich,"or enhance, the IPA with materials having educational value, so that the technicians can increase their skills while performing their tasks. Elements of this approach are found in AAT, FOMM, and SPA.

At a more practical level, TO Managers have been instructed to "tailor" the TO procurement specifications so that the TOs acquired for a particular program contain all the data needed to support a particular weapon system, in the desired format, without purchasing unnecessary data or [illegible] formats. The problem is, *of course*, *deciding* what data, and what formats, are the "right" one.

6.3 SELECTION METHODOLOGY ALTERNATIVES

6.3.1 BACKGROUND. The central objective of research in selection methodology has been to increase the usability of technical manuals, thereby reducing overall system *maintenance* and support cost.

TM usability problems are conflicts between conditions of use in [illegible] system and the formats [illegible] of the system [illegible] TM [illegible]. Such conflicts may cause [illegible] to underuse the TM because the effort required to overcome the conflict is more than the [illegible] benefit of using the TM. These conflicts may explain [illegible] that technicians spend very little [illegible] their time referring to TM. When format and media do not match conditions of use with [illegible] technicians have two options. They may reject TM as a source of guidance in favor [illegible] convenient but more fallible source (e.g., memory, peers, ingenuity, or supervisors with limited [illegible]) or they may try to use the TM in spite of its usability problems. Both alternatives contribute to ineffective maintenance [illegible] removals frequently exceed 20 percent, and performance capability of new technicians [illegible] of the complex maintenance activities.

In recent years, there have been four basic approaches put forth to solve the IPA selection [illegible]: (1) the description of IPA fundamental elements [illegible] low cost ownership of technical manuals (6.3.2); (b) the organization of IPAs into basic format [illegible] types (6.3.3); (c) [illegible] of IPA system components [illegible] task, environment, and [illegible] factors (6.3.4); and (d) application of a time step [illegible] algorithm based on relevant decision [illegible] (6.3.5). Each method is briefly summarized in the following paragraphs.

6.3.2 FUNDAMENTAL ELEMENTS. In a study conducted for the U.S. Army Human Engineering Laboratory [illegible] task dealt with the problem of identifying the fundamental elements of IPA that [illegible] maintenance performance and cost. [illegible] applied the fundamental elements [illegible] Army maintenance situations and prepared [illegible] IPA specification that [illegible] fundamental elements. A fundamental element was [illegible] as a technological [illegible] for producing a new type of TM, each process converting one [illegible] of information into another kind. [illegible] illustrates the fundamental elements [illegible] determined to be [illegible] were supported by factual data which [illegible] used for preparing a [illegible] that [illegible] the IPA concepts evaluated [illegible] fundamental elements

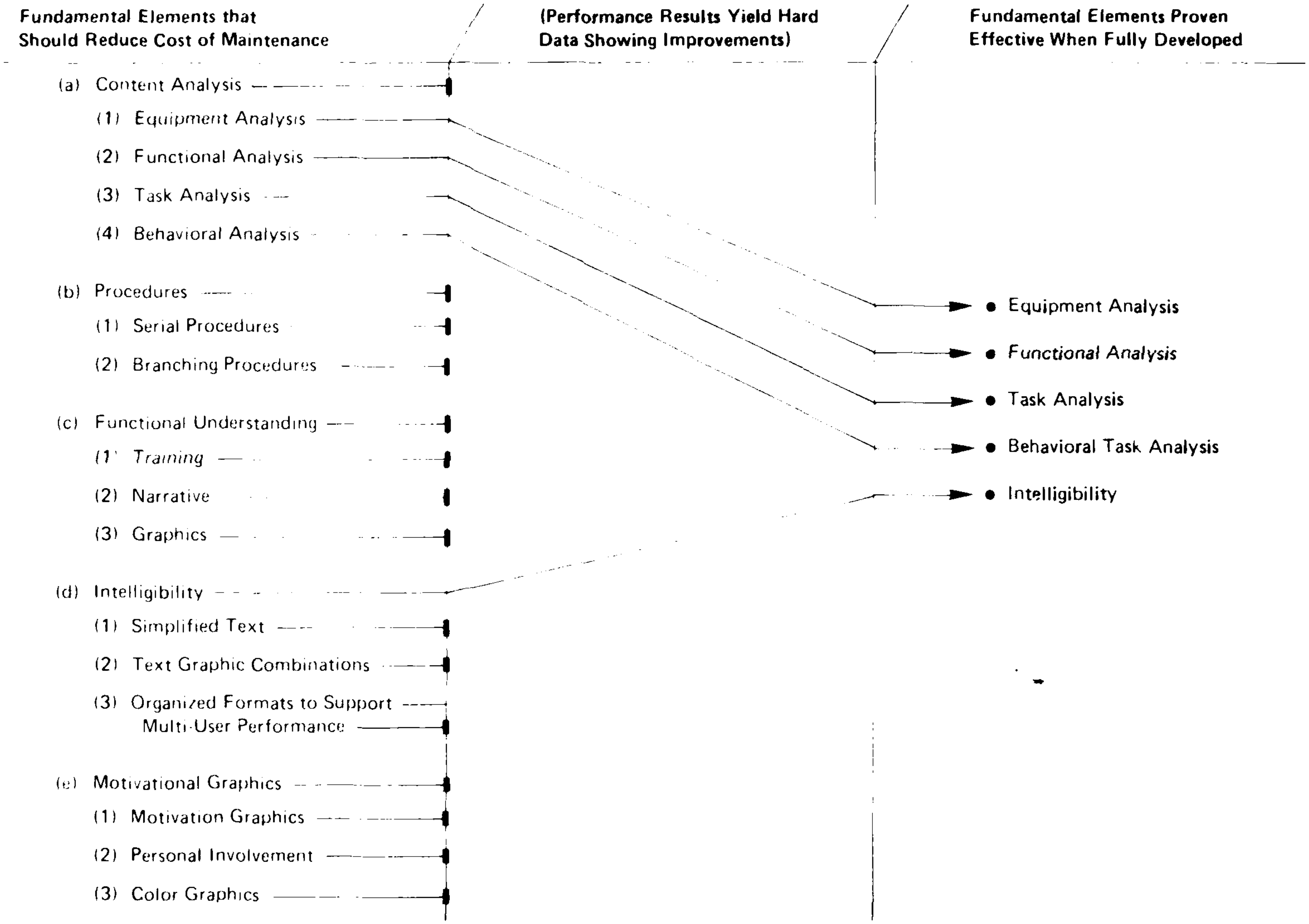


Figure 6-1. Identification of JPA Fundamental Elements That Reduce Maintenance Cost (Adapted from Ref. 81 data)

would result in improved cost of maintenance when fully developed. They further projected that the inclusion of a fully developed form of any one of the five would result in some measure of improvement. Note, however, that four of the five fundamental elements are analytic processes; the fifth, *intelligibility*, relates to formats, but only peripherally.

6.3.3 ORGANIZATION BY FORMAT/CONTENT TYPES. A different approach, partially developed under contract to the U.S. Navy Ship Research and Development Center (*Refs. 21, 24, 26, & 25*) dealt with the format content characteristics of JPAs in relation to the types of maintenance to be performed and the conditions under which that maintenance was to be performed. The process of selection is illustrated in Figure 6-2; the system conditions to be considered are partially identified in Table 6-1. The basic premise of this method is that the characteristics (directivity, packaging, cost factors, etc.) of the various JPA techniques can be correlated in a positive, negative, or neutral way with the types of maintenance actions to be performed under specified conditions of the system. This method, while recognizing the importance of front-end analysis, limits formal analysis requirements to the development of a Task Identification Matrix (TIM) as a preliminary step in identifying maintenance actions and system conditions. Actual selection of formats is based on weighing the benefits of competing formats and making an informed decision.

6.3.4 USER/DATA MATCH MATRICES. This method, developed during a continuing study for the Navy Technical Information Presentation (NTIP) Program (*Ref. 77*), is a model consisting of three types of matrices which can be used to determine types of tasks, associated presentation methods, and required features of the media. The model, illustrated in Figure 6-3, is based on three critical inputs: equipment type (and main components); personnel characteristics; and environment. The method involves building the matrices for each personnel type, equipment type, etc. Although the authors describe the process as a "simple, step-by-step" approach, much of the analytical effort must be accomplished prior to considering a specific system, and the results can be quite complex and voluminous. Table 6-2 illustrates a portion of one of the resulting matrices, for one type of personnel. The alphanumeric codes in the body of the table identify estimated utility levels, information source value, and the availability of alternative presentation components (or combinations thereof).

6.3.5 JPA SELECTION ALGORITHMS. Under the cognizance of the Navy Personnel Research and Development Center, a study was conducted (*Ref. 2*) to develop an algorithm for selecting JPA format and content that considers training, media, and work-center job designs. The primary objectives of the development were (1) to identify JPA research and technology gaps, (2) to identify candidate JPA Systems for Navy personnel, maintenance, and training trade-off analyses, (3) to select specific JPA Systems for test and evaluation, and (4) to identify complementary training levels for selected JPA Systems.

A nine-step selection algorithm, illustrated in Figure 6-4, was developed to identify the most appropriate JPA training combinations for the JPA System level of a tri-level conceptual organization of JPA technologies. The nine decision steps were based on seven primary decision criteria (aptitude, job experience, task type, task complexity, equipment type, equipment complexity,

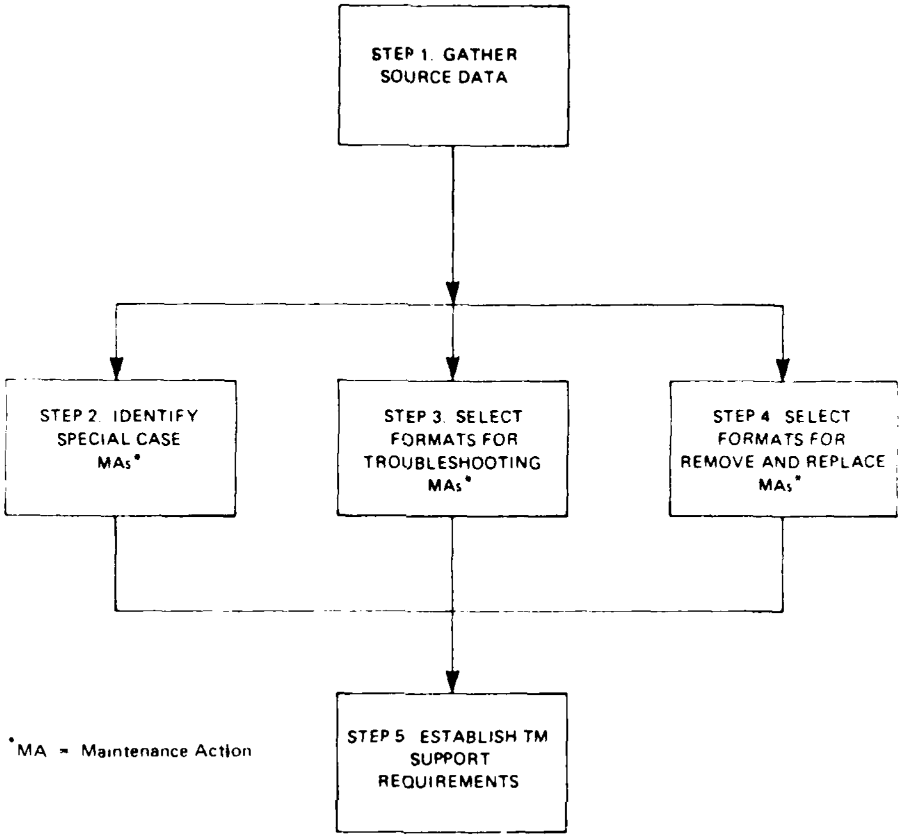


Figure 6-2. --Overview of the Selection Method (Ref. 24)

Table 6-1. System Conditions Affecting Formats and Media (Ref. 24)

Task	**Personnel**	**Hardware**	**Workspace**
Troubleshooting Remove and Replace Testing Technique Special Case Actions • SOP • 1 Trial • Calibration • Hazardous • Periodic	Turnover Time to Proficiency Span of Supervision Personnel Qualification Standard General Classification Test (GCT) Job Scope	Automated Test Equipment Status Displays Distribution Size Readiness Impact Subordination Maintenance Demands Replication Installation Context	Illumination Space Elements (Rain) Cleanliness

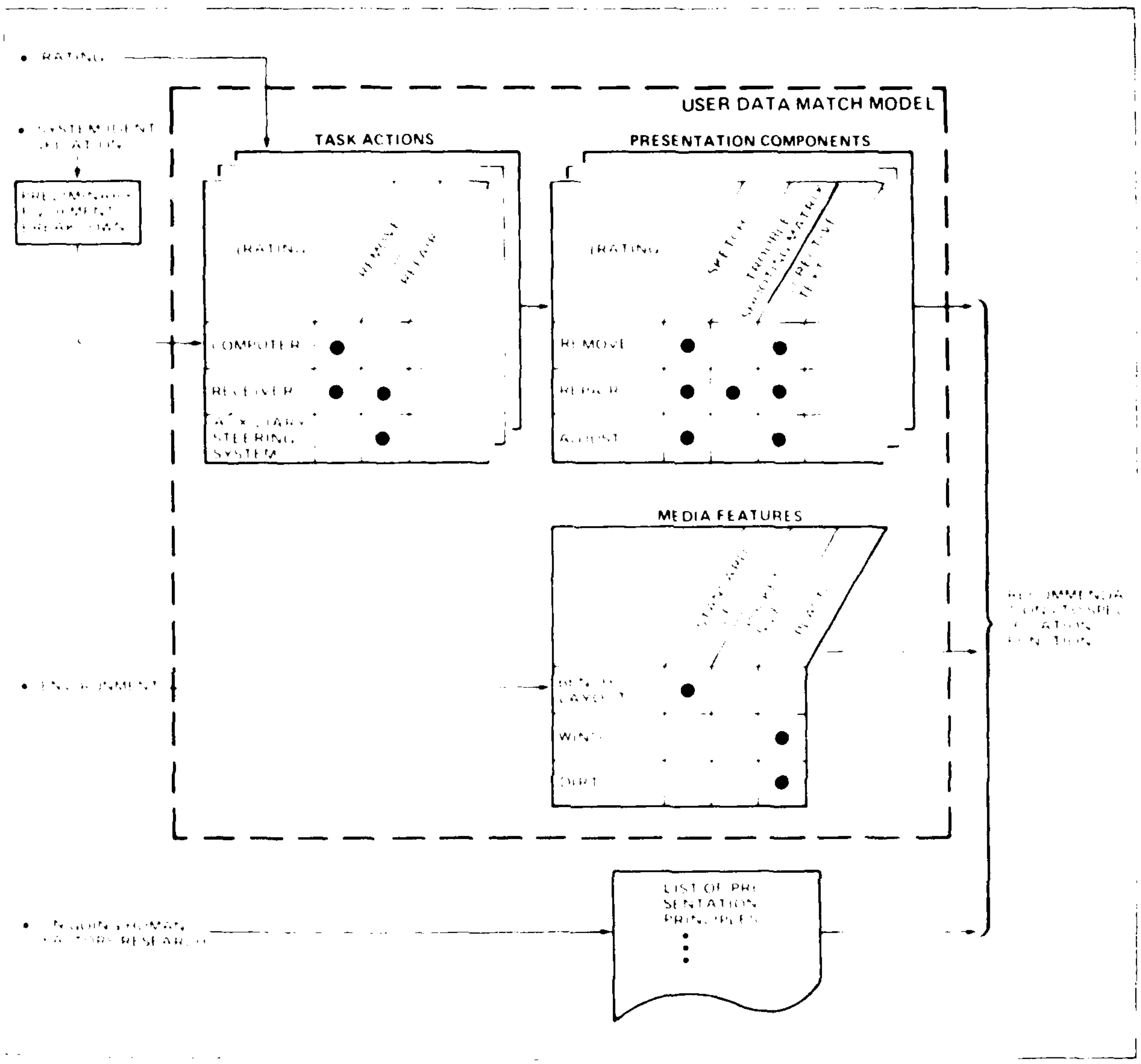


Figure 6-3. Main Elements of the User Data Match Model (Ref. 77)

Table 6-2.—Selection Guide Relating Tasks at Four Levels of Equipment Complexity to Presentation Components of "Hard Copy" Presentation Components (Ref. 77)

AVIATION ELECTRONIC TECHNICIAN (AT)
Major Work Emphasis: A/C Electronics
Reading Grade Level: 12.7
Est Wks School Reqd: 16.8

Task Actions by Levels of Complexity		Photograph	Airbrush Photo	Airbrushed Drawing	Sketch	Engineering Drawing	Two-Dimensional	Three-Dimensional	Assembled	Exploded	Cut-Away	Schematic	Coordinate	Line and Leader	Overall Block	Detailed Block	Schematics	Wiring	Cabling	Functional Signal Flow	Digital Logic	Blocked Schematics	Clocked Digital Logic	Pictorial Block	Timing	Maintenance Dependency Chart	Decision Trees	Waveforms	Graphs	Directive	Deductive	Continuous	Segmented	Retrieval-Oriented	Glossary Abbreviations	Materials	Wire	Procedures	Specialized Data	Specialized Data	Retrieval-Oriented Matrix
System	Adjust																																								
	Inspect																																								
	Install																																								
	Isolate Faults																																								
	Repair																																								
	Service																																								
Equipment	Adjust																																								
	Calibrate																																								
	Degauss																																								
	Inspect																																								
	Install																																								
	Isolate Faults																																								
	Remove																																								
	Repair																																								
	Test																																								
	Tune																																								
Assemblies	Adjust																																								
	Inspect																																								
	Install																																								
	Isolate Faults																																								
	Remove																																								
	Repair																																								
	Replace																																								
	Service																																								
	Test																																								
Part	Adjust																																								
	Dispose of																																								
	Inspect																																								
	Install																																								
	Measure																																								
	Remove																																								
	Repair																																								
	Replace																																								
	Test																																								

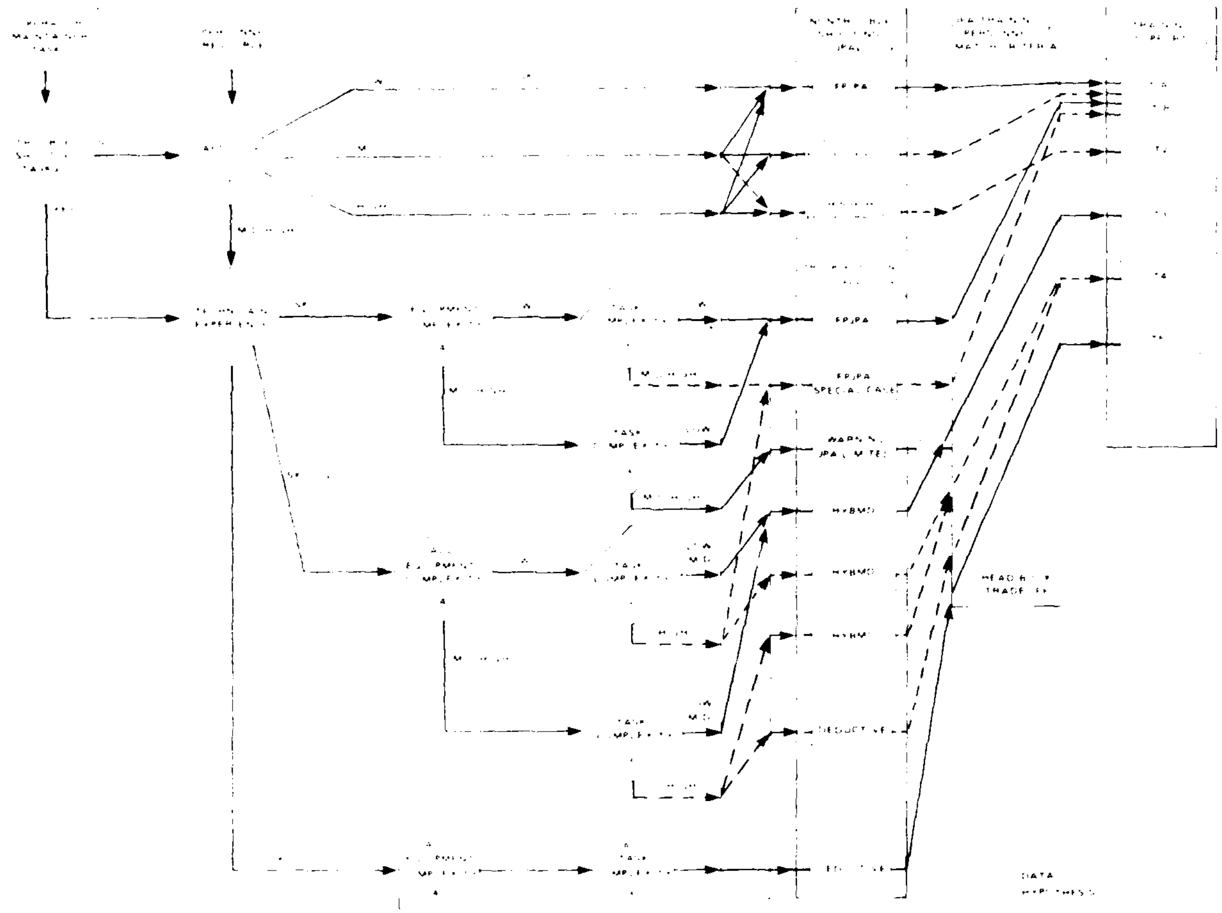


Figure 6-4.—JPA Training Selection Algorithm (Ref. 2)

and degree of proceduralization) established in the literature as critical to on-the-job performance. A graphic representation of the decision steps and *amplifying guidelines* for exercising the algorithm were *developed and applied* to three performance aiding scenarios and two Navy ratings.

Note that the algorithm is specifically intended for examining the tradeoff between aiding and training, as part of the Navy's Integrated Personnel System research model.

6.4 FOSDIC APPROACH–SUPPORTING DATA

6.4.1 RATIONALE. The selection methodologies described in Part 6.3 have certain factors in common, as well as significant differences. Two of the methods (user data match; JPA selection algorithm) tend toward establishing a step-by-step procedure for making a selection, and both require an extensive data base for input data. The fundamental elements method is heavily oriented toward front-end analysis, with little attention being paid to format characteristics. The selection algorithm and fundamental elements methods are oriented as much toward the training question as toward performance aiding. *Three* of the methods, the only exception being the fundamental elements approach, recognize the significance of system conditions in making a valid selection, and all of the methods depend on an assessment of the characteristics of using personnel. The four methods have one other factor in common: None has *been used for the* selection of formats in an acquisition *program*, although several have been used on an experimental, or trial, basis.

As a consequence, the FOSDIC approach described in AFHRL-TR-80-50 is not based on the specific methodology developed in any of the foregoing studies, although it is derived in part from the format content organization method described *in Reference 21*. This approach is believed to be the most realistic in terms of the input data that are available, and it properly leaves the selection decision with the TO Manager. It is a heuristic approach that, while assisting the TO Manager in identifying the factors and conditions to be considered, will not make the selection decision.

6.4.2 SUPPORTING DATA. The basic FOSDIC approach is fully described in Section 6 of AFHRL-TR-80-50; there is no need to repeat it here. The remainder of this section provides more complete descriptions of the various system conditions that should be considered, including some which are not part of the basic FOSDIC approach.

6.4.3 SYSTEM CONDITIONS DEFINED. In the broadest sense, system conditions are *all* the factors and influences which pertain to the system during its entire life cycle. That cycle begins with initial assembly of the system and ends when the system has *been* permanently removed from service and *disposed of*. For our purposes, system conditions can be defined in a somewhat narrower sense: System conditions are the *maintenance-relevant* factors and influences which pertain to the procedural data for the system. Five categories of maintenance-relevant system conditions are included, encompassing twenty-seven (27) conditions. Table 6-3 presents the conditions comprising each category. Note that the left-hand column, *Activity*, deals with the types of tasks that maintenance personnel may be called upon to perform. The remaining four columns identify the system conditions which may affect the performance of those tasks, either positively or negatively, depending on the type of format (and media) selected. Table 6-4 displays which

Table 6-3.—Identification of System Conditions Affecting Format Selection

A. Activity	B. Maintenance Level	C. Personnel	D. Equipment	E. Environment
1. *Troubleshooting*	1. Organization	1. Turnover	1. Automated Test	1. Cleanliness
a. Fault Identification	2. Intermediate	2. Time to Proficiency	2. Status Displays	2. Working Space
b. Fault Isolation	3. Depot	3. Span of Supervision	3. Testing Technique	3. Illumination
		4. Job Scope	4. Distribution	4. Elements
2. Remove Install		5. Air Force Specialty Qualification Standard (AFSQS)	5. Size	
		6. Skill Level	6. Readiness Impact	
3. Special Case			7. Subordination	
a. *SOP*			8. Maintenance Demands	
b. One Trial Learning			9. Replication	
c. Hazardous			10. *Installation Context*	
d. Calibrate				
e. Adjust				
f. Align				
g. Inspect				
h. Lubricate				
i. Clean				
j. Repair				
k. Operate				
l. Operational Check				

Table 6-4. – Association Between System Condition Categories

System Conditions		Conditions Variables	Activity: Trouble-shooting	Activity: Remove and Install	Activity: Special Case	Support Requirements
Maintenance Level		Organizational/Intermediate/Depot	X	X	X	X
PERSONNEL	Turnover	Low/High	X	X	•	
	Time to Proficiency	Short/Long	X	X	•	
	Span of Supervision	Low/High	X	X	•	
	Job Scope	Narrow/Broad	X	X	•	
	AFSQS	Match/Mismatch	X	X	•	
	Skill Level	Low/High	X	X	•	
EQUIPMENT	Automated Test	Absent/Present	(1)		•	X
	Status Displays	Absent/Present	(1)		•	X
	Testing Technique	Internal/External	X		•	
	Distribution	Dispersed/Consolidated	√	X	•	X
	Size of Information Base	Small/Large			•	X
	Readiness Impact	System Down/Operable	X	X	•	
	Subordination	*Complex/Simple*	X		•	
	Maintenance Demands	Batch/Single	X	X	•	
	Replication	Many/Few			•	X
	Installation Context	Isolated/Associated			•	X
ENVIRONMENT	Cleanliness	Clean/Dirty			•	X
	Working Space	Limited/Nonlimited	√	√	•	X
	Illumination	Normal/Abnormal			•	X
	Elements	Wet/Dry			•	X

Legend: X Direct influence
√ Indirect or marginal influence
• Depends on particular type of task text
(1) Considered as part of Testing Technique

activities (tasks) are most closely associated with which maintenance level, personnel, equipment, and environment system conditions. In addition, the state, or variable, for each system condition that can be used as a format selection decision tool is identified. A description of each of these conditions is presented below.

6.4.4 ACTIVITY RELATED CONDITIONS. Three types of activities are to be considered: (a) troubleshooting maintenance actions (MAs); (b) remove and install MAs; (c) special case MAs.

6.4.4.1 Troubleshooting. This type of maintenance action is the process of localizing a fault or malfunction within a system or equipment. Two levels are generally recognized. If troubleshooting extends to the point where corrective action can be initiated, it is referred to as fault isolation; if it extends only so far as to determine disposition (e.g., forward to the next higher maintenance echelon) it is referred to as fault identification. The distinction is most important when different organizations are involved in the process. Thus, if a fault is localized on the flight line to a particular LRU, corrective action can be initiated at the organizational level (Replace LRU). This would be fault isolation for the organizational level. If, however, the maintenance concept called for that LRU to be sent to a higher maintenance level for further troubleshooting, the activity at organizational level was only fault identification. When fault identification takes place in one organization, and fault isolation takes place elsewhere, a third troubleshooting activity is included — fault reporting. This provides the organization charged with fault isolation with the result of the other organization's fault identification activity, which will then not need repeating.

Since the maintenance concept applicability for particular LRUs may not be sufficiently well defined when the TO Manager is making the initial selection of formats, an approximation can be made by considering whether troubleshooting can reach the point of initiating corrective action, at the organizational level, on the basis of alternative signals or status displays. Organizational level troubleshooting usually does not require access to the interior of an item of equipment.

6.4.4.2 Remove and Install. This type of maintenance action is the predominant means of accomplishing corrective action in Air Force systems. The activity may range from extreme simplicity (replacement of a readily accessible plug-in unit) to extreme complexity (disassembly-reassembly of complex electromechanical pneudraulic subsystem). Organizational level maintenance is characterized by the former, but wide variations are possible, and depend on system design, the maintenance concept, and many other factors.

6.4.4.3 Special Cases. Table 6-3 lists 12 subtypes of task activities under the heading of special case maintenance actions. The TOSDIC approach guidelines for simplicity include special case MAs with remove-install MAs in the category of non-troubleshooting maintenance. They are grouped together in this description because the nature of the particular task is a more important determinant of format requirements than are the other prevailing system conditions. Research evidence and TM practice have shown (Ref. 24) that, regardless of system conditions, certain formats have proven to be cost effective for these "special case" MAs. These actions are discussed in the following text. Each discussion defines the MA category and illustrates the preferred format.

a. **Standard Operating Procedures (SOPs):** A standard operating procedure (SOP) is a performance sequence that supports many MAs (i.e., sequence X is to be performed prior to all checks, tests, and troubleshootings of system Y). Describing SOPs fully each time they are required would be costly. To minimize cost, the treatment prescribed for SOPs is: (1) describe it once in a dual-level version of a fully proceduralized format, and (2) include a reference to the SOP description in each of the MAs being supported. Typical SOPs are listed below:

- Set up common test equipment
- Turn-on and shutdown procedures
- Applying auxiliary power
- Common operating sequences, e.g., switch from mode to mode.

SOPs are difficult to identify prior to the conduct of a task analysis. Some guidelines to help identify instances where SOPs are likely to be needed are annotated below.

- MAs that require the use of standard test equipment (e.g., signal generators) are likely to include SOP sequences.
- Any MA conducted off line is a likely candidate to include SOPs (e.g., test rig setups, connections of auxiliary power).
- Components that require a standard repair action are candidate SOPs, e.g., a soldering action necessary to remove all parts from a circuit board.
- Tests and checkouts which require that the system be placed in a special condition (setup of a particular mode of operation).

Figure 6-5 illustrates the format to use for the full description of the SOP. The rationale for using this format is that, while frequent performances of an SOP suggest that they be learned, some technicians may be performing the SOP for the first time, or for the first time in quite a while. The features of the sample which support this situation are:

- Hierarchical arrangement of tasks to facilitate learning
- Phrases in the upper hierarchies to facilitate use as a checklist
- Detail in the lower hierarchies to facilitate use as a job guide.

b. One Trial Learning MAs: Design for maintainability has advanced to such a stage that many systems include a considerable number of easy-to-perform activities, even to the point where the "how to" is apparent from a quick inspection. However, the technician has information needs even for this simple class of performance, particularly at the organizational level. For example, removal and *replacement* of *plug-in units* is a *one-trial* learning MA, but the technician still needs to find the general area of the unit to be replaced, and must still be able to recognize the unit. Therefore, a location diagram is required to support these types of special case MAs. Figure 6-6 illustrates the information format appropriate to support this type of performance.

REMOVE AND INSTALL FLOWMETER TRANSMITTER

Install Flowmeter Transmitter

NOTE

All replacement flowmeters have been calibrated and filled with Amso 140, Type 2 calibration fluid (Mil F 7024, or equivalent). The calibration fluid should be removed from all replacement flowmeters before installation onto the engine.

Lack of fluid in a flowmeter can cause damage to the jewel bearings and pivots. If the replacement flowmeter has no fluid in it or if there is evidence that it has been jarred or dropped, it should be sent to an overhaul depot for calibration.

CAUTION

The flowmeter transmitter is a delicate instrument and should be handled carefully.

1. Install flowmeter onto connector (8).
   a. Remove caplug from connector at (8).
   b. Lubricate and install O ring.
   c. Using 0-150lb in. torque wrench, torque four bolts to 24-27 lb. in.
   d. Safety wire four bolts.

2. Install connector (10).
   a. Lubricate and install O ring onto shoulder of connector.
   b. Torque four bolts to 24-27 lb. in.
   c. Safety wire four bolts.

CAUTION

The flowmeter (7) can be damaged if the fuel connector (10) is not supported with a wrench when torquing coupling nut (9).

3. Reconnect fuel hose.
   a. Remove caplugs PP100 and WW-19 at (9).
   b. Lubricate connector threads.
   c. Using 500 to 1000 lb. in. torque wrench, torque coupling nut to 650-750 lb. in.

NOTE

Do not lubricate O-ring.

4. Reconnect connector (6).
   a. Remove caplugs EC-10 and EP-10.
   b. Install O-ring.
   c. Safety wire connector (6).

END OF ACTIVITY

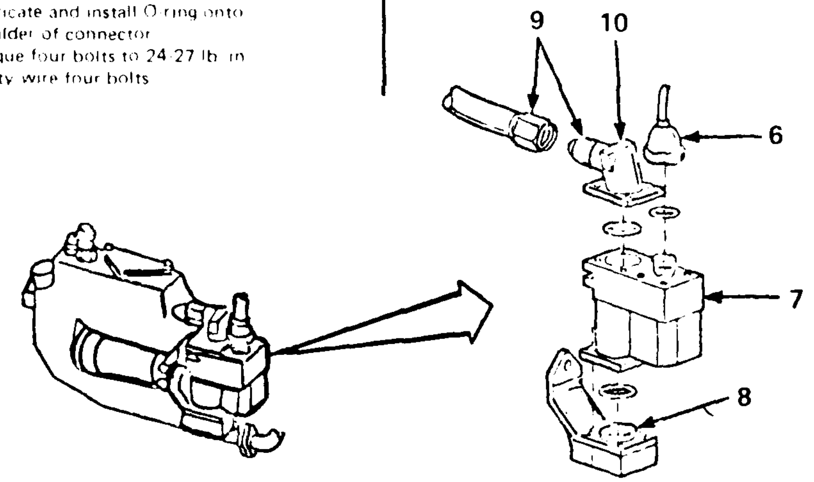


Figure 6-5.–Preferred Format for a Fully Proceduralized, Dual-Level Description of an SOP (Ref. 24)

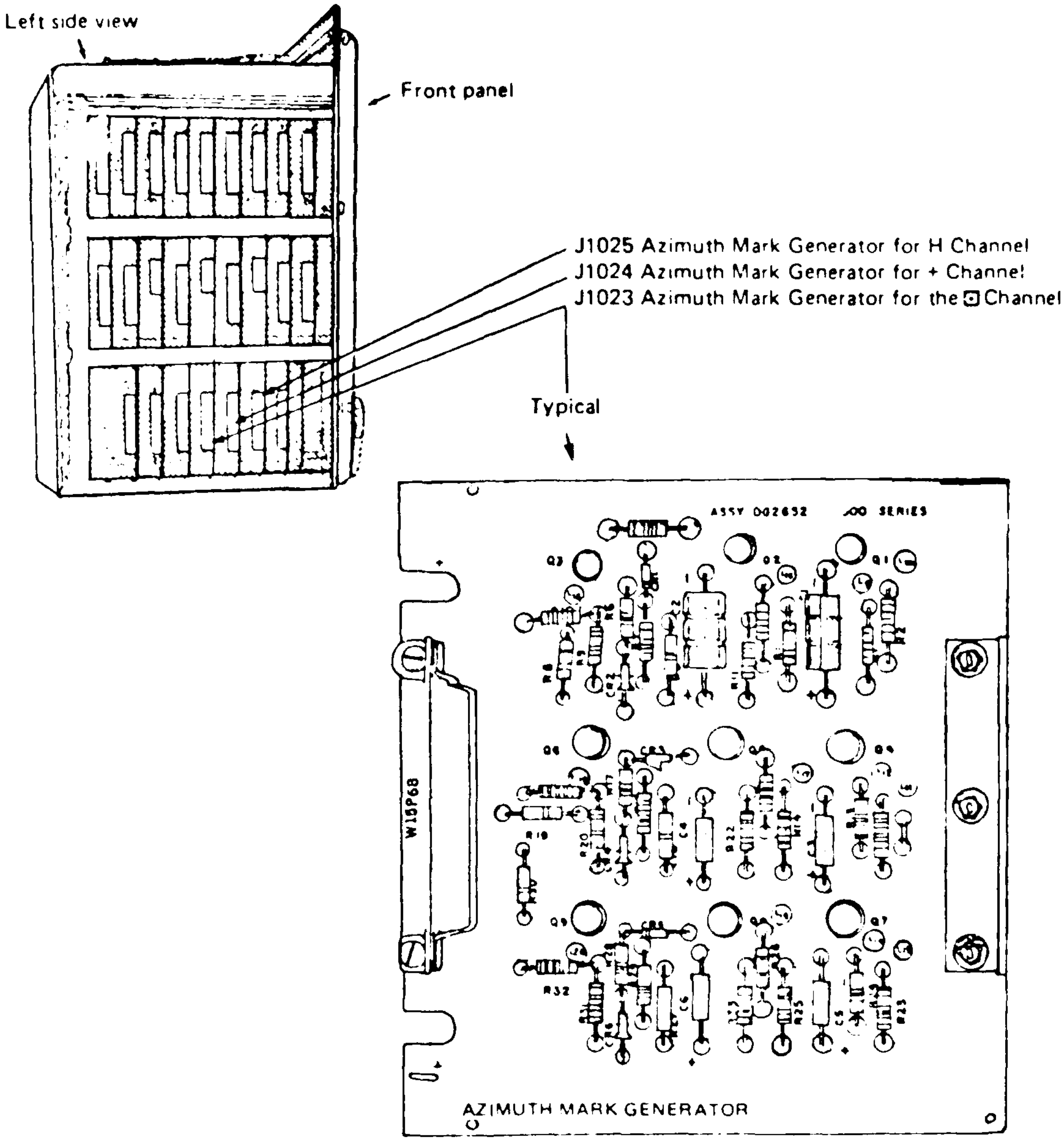


Figure 6-6.–Location Diagram Suitable for Supporting One-Trial Learning Action

[illegible] MA [illegible] calibrations, adjustments, and align- [illegible] MA [illegible] difficult to perform. The difficulty may result [illegible] interdependent tolerances or the iterative form of [illegible] may also fall into this category. [illegible] appropriate to apply a strong perfor[illegible] [illegible] proceduralized format (Figure 6.7) by [illegible] for the adjustment [illegible]. The [illegible] completing [illegible] all [illegible] the MA.

Install and Adjust Aux Air Door Caution Light Switch

1. Request assistant gently lift door until it is nearly closed and allows just enough room for switch wire.

NOTE

For proper continuity through switch leads, the multimeter needle must touch the "O" mark on the scale when door 81L is 6.0 ± 0.1 inch from mold line of the aircraft. If the needle is at any other position, it indicates that the switch is out of alignment and requires adjustment.

2. Request that assistant lower door and hold so position of leading edge of door 6.0 ± 0.1 inch from mold line of aircraft.

3. Check that multimeter needle touches the "O" mark on the scale with door in this position.

NOTE

If multimeter needle touches the "O" mark, remove switch wires from multimeter probes and go to page 15. If needle is at any other position, go to page 12.

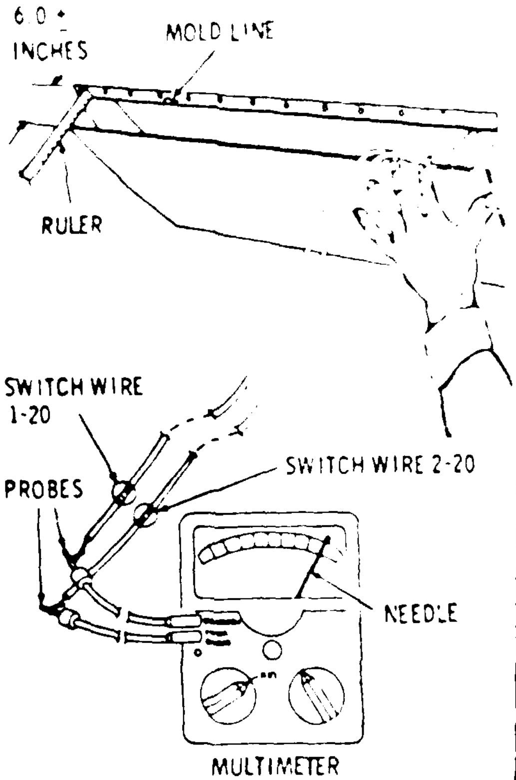
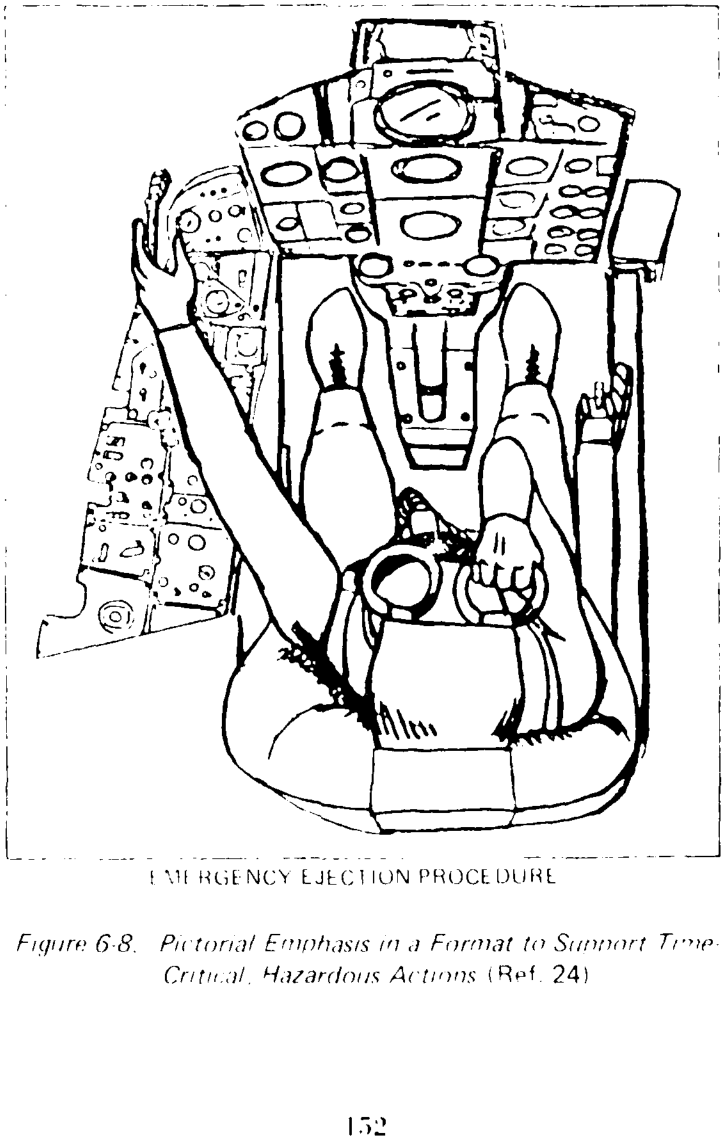


Figure 6.7. Proceduralized Format Emphasizing "Training Notes" Intended to Support Unusually Complex MAs

d. Time-Critical, Hazardous MAs. Many operator and technician actions must be performed rapidly and precisely to prevent damage to equipment or injury to personnel. Technicians performing these actions do not have time to rely on job guides or checklists to aid their performance; they must know without hesitation what to do and how to do it.

Actions of this type will normally be stressed in training, but opportunities to practice performing these MAs are rare. Therefore, the TM can help by including performance descriptions in a fully proceduralized format that emphasizes pictorial representations of the steps involved. The rationale for the use of this format is that pictorials are less ambiguous and easier to remember (and rehearse) than their narrative counterparts.

Figure 6-8 illustrates the format recommended for these applications. The sample emphasizes the use of pictorials in describing user actions, especially those which involve unusual manipulations.



EMERGENCY EJECTION PROCEDURE

Figure 6-8. Pictorial Emphasis in a Format to Support Time-Critical, Hazardous Actions (Ref. 24)

c. Periodic Maintenance. The majority of preventive maintenance (e.g., inspect, lubricate, clean, etc.) is done periodically (e.g., weekly, daily) or at least on the basis of regular events (e.g., 1000 hour check, once for every mission, etc.). The positive effect that this regularity characteristic has on proficiency is countered somewhat by the sometimes lengthy performance sequences involved.

Experience has shown that providing a modest amount of detail in the descriptions of these procedures satisfies the technician's need for guidance. The suggested format for such a description relies heavily on narrative statements of performance. Figure 6-9 illustrates a representative sample of the format that should be used in describing these actions. When appropriate, simplified illustrations can be added to support the narrative.

6.4.5 MAINTENANCE LEVEL CONDITIONS. Three maintenance levels are important when considering format selection: organizational, intermediate, and depot. Definitions of each level are included in Section I. Maintenance level is a factor for consideration when examining any system condition. Consequently, the TO Manager must consider the format requirements under at least one, and possibly all three, of the maintenance levels. Other considerations being equal, organizational level maintenance should be supported by fully proceduralized instructions, intermediate level maintenance by partially proceduralized and logic deductive aids, and depot maintenance by system descriptive aids. The maintenance concept may, in some cases, call for other levels of maintenance, e.g., factory or contractor. Maintenance at these levels, however, is not normally supported by TOs, so a format selection decision by the TO Manager is not required.

6.4.6 PERSONNEL RELATED CONDITIONS. Table 6-4 lists six system conditions that are a function of the maintenance personnel who are, or will be, assigned to the system. Generally speaking, all six are important predictors of format requirements for both troubleshooting and remove/replace maintenance actions. In the following descriptions, the condition variables which are indications of format choice are also described. As with other system conditions, the format selection process based on personnel related conditions must be iterative, with reevaluation as the system data become more definitive.

6.4.6.1 Personnel Turnover: Timely maintenance performance requires that the technicians know or be able to obtain certain job information (e.g., equipment recognition, tool usage, safety precautions). Typically, deductive formats do not contain this information, requiring that it must come from training, either formal or OJT. This training takes time (reducing on station time), costs money, and reduces the amount of productive utilization of designated personnel.

Personnel turnover may be difficult to predict when new systems are being planned, since there will be little or no historical basis for the judgment. Estimates can be made, however, on the basis of such factors as system installation locations, the manning plan, and the type of system. "Good duty" locations are likely to have lower turnover rates. Likewise, systems that are modern and "challenging" are more likely to show a good retention rate. Manning tables for a system that indicate a high percentage of lesser-skilled personnel (1- and 3- skill levels) are indications that a high turnover rate can be expected. A personnel turnover condition is considered high when 50 percent or more

COMPONENT/SYSTEM	C.P. NO.
FUEL OIL STRAINER, DUPLEX	FODS

C.P. DESCRIPTION	RATE	TIME
SHIFTING, INSPECTION, CLEAN, OPERATING	PO3	10 MIN

PROCEDURE

11 Remove strainer basket from idle strainer chamber

12 Inspect basket for foreign matter

13 Clean strainer basket dry with low pressure air

14 Blow strainer basket dry with low pressure air

15 Inspect strainer basket for cracked or broken mesh

NOTE Renew if required

16 Remove cap gasket from idle strainer chamber

17 Inspect cap gasket for

- a Cracks
- b Breaks
- c Deterioration

NOTE Renew if required

18 Reinstall cap gasket

19. Reinstall basket

CAUTION ENSURE STRAINER CAP IS PROPERLY SEATED

20 Reinstall cap.

21 Shut drain valve on idle strainer chamber.

CAUTION BOTH STRAINERS ARE PRESSURIZED WHEN SHIFT LEVER LOCKING DEVICE IS RELEASED

22. Test and vent idle strainer chamber as follows

- a Crack open vent valve on idle strainer.
- b Release shift lever locking device
- c. Shut vent valve on idle strainer when oil flow appears

Figure 6-9. Sample Format for Describing Periodic MAs (Ref. 24)

of the workforce can be expected to leave in a calendar year. This state implies a minimum front end training investment for entry level technicians. In considering this condition . . .

Use the proceduralized format (which minimizes training) when the personnel turnover is expected to be high. Where turnover is lower, greater amounts of career related training are justifiable, permitting greater use of deductive aids for both troubleshooting and remove install MAs.

Condition	Variable	Troubleshooting	Nontroubleshooting
Personnel Turnover	Low	Deductive	Deductive
	High	Proceduralized	Proceduralized

6.1.6.2 Time to Proficiency: Effective manpower utilization demands minimum time to proficiency on all tasks, especially the more difficult troubleshooting performances. On every new task, there is at least a minimal learning period. The more complex the task, or the less well prepared the technicians to perform the task, the longer the learning period. Lengthy learning periods delay the achievement of proficiency in performance. Proficiency connotes knowing what to do and performing without error or undue delays. Achieving proficient levels of performance is a gradual process for most tasks, so projecting that point in time where a technician "is proficient" can be difficult. The best source of information on which to base this judgment is the performance of similar personnel accomplishing *equivalent tasks on similar equipment.*

In applying this condition . . .

Use a proceduralized troubleshooting format in cases where time to proficiency exceeds 1/3 of the usual tour length. Conversely, a short time to proficiency indicates that personnel can perform well with the deductive troubleshooting format.

Condition	Variable	Troubleshooting	Nontroubleshooting
Time to Proficiency	Long OJT	Fully proceduralized	Proceduralized
	Short OJT	Deductive	Descriptive

In some cases, personnel turnover combines with time to proficiency to indicate a need for a combination of two troubleshooting formats. Specifically, a lengthy proficiency period (indicating complex performances) can occur with a low personnel turnover (indicating a user need to acquire career relevant skills). This combination of conditions indicates a need for *both* formats keyed to each other. The proceduralized element: (1) lets the new technician be a productive member of the workforce, and (2) teaches the new technician how to troubleshoot using the deductive element. The Augmented Action Tree (AAT) is an example of this combination of aid types.

6.4.6.3 Span of Supervision. This system condition is predictable with reasonable accuracy from the preliminary manning tables for a new system. The span of supervision is the ratio of supervisory level technicians (5- or 7- level) to non-supervisory personnel (3- or 4- level) in the maintenance crew. Supervisors must share their time between administrative requirements (records, reporting, etc.) and providing assistance and guidance to the technicians under their supervision.

Low spans of supervision (viz., 2 or 3 workers per supervisor) mean that the supervisor probably participates in technical work either directly or by supporting less experienced technicians. These cases suggest the use of deductive aids to support troubleshooting, since the supervisor is available to guide inexperienced technicians if needed. Higher supervisory spans mean more administrative duties for the supervisor and less time available to help junior technicians. Therefore, a proceduralized format is indicated.

The deductive format for presentating remove and replace information may be used effectively in spite of its complexity wherever the span of supervision approaches unity. The rationale is that, if necessary, the supervisor will have time to assist the junior technicians in interpreting the deductive aid. Therefore, the guidance for considering this condition is . . .

Consider the proceduralized format when the span of supervision is expected to be large, viz., greater than 1 supervisor to 10 technicians.

Condition	Variable	Troubleshooting	Nontroubleshooting
Span of Supervision	Low	Deductive	Descriptive
	High	Fully proceduralized	Proceduralized

6.4.6.4 Job Scope. This condition relates to the day to day responsibilities of the AFSCs involved in maintaining the system. Some technicians, for example AFSC 426x0 (Aircraft Propeller Mechanic), spend the majority of their time maintaining a single portion of a system—a relatively narrow job scope. Others, such as AFSC 432x5 (Aerospace Ground Equipment Mechanic), may have a wide variety of electrical, electronic, mechanical, and other types of equipment to maintain. Furthermore, depending on the number of systems, maintenance crew manning, skill levels, etc., technicians may spend all their time in troubleshooting activities, or in non-troubleshooting maintenance functions.

The scope of a maintenance job may be quite broad, requiring the incumbent to be proficient on a wide variety of maintenance actions, possibly over two or more systems. Conversely, an incumbent's job scope may be quite narrow, involving frequent performance of a relatively small number of actions. Technicians having a broad job scope are less likely to be knowledgeable about each area of their responsibilities, and specific, task oriented guidance is needed. The guidance for considering this condition is . . .

The broader the scope of the job, the more urgent the need for the proceduralized format.

Condition	Variable	Troubleshooting	Nontroubleshooting
Job Scope	Broad	Proceduralized	Proceduralized
	Narrow	Deductive	Descriptive

6.4.6.5 **Air Force Specialty Qualification Standard (AFSQS)**: This system condition relates the types of skills and knowledge which Air Force personnel can be expected to have to the requirements which *maintenance* of a particular system may impose. Qualifications for an Air Force Specialty (AFS) are included in the AFS description, as shown in Figure 6-10, and are based on adequate performance in the specialty.

Air Force Specialties provide the occupational standards for procurement, training, education, utilization, classification, and career development of airman personnel and for structuring positions for such personnel. Qualification standards are stated in five parts: (a) Knowledge, (b) Education, (c) Experience, (d) Training, and (e) Other.

a. *Knowledge*. The scope of factual understanding and practical military skills required for successful performance in the specialty.

b. *Education*. The scope of study or instruction in academic subject matter or academic disciplines required or desired for effective performance in the specialty.

c. *Experience*. The scope of previous engagements in military or civilian work activities under specified conditions which provide skills and abilities desired or required to perform the duties of the specialty.

d. *Training*. Required or desired military courses of instruction that train for, or contribute directly to, effective performance in the duties of the specialty.

e. *Other*. Measurable qualifications such as physical standards, security clearance, certifications, and licenses required for performance in the specialty.

Information on the AFS designated for the conduct of system maintenance is usually developed during the Logistics Support Analysis (LSA) for the system. The AFSs may also be determined by review of the personnel requirements and training specifications for the system. It is unlikely that every equipment item will have an appropriate AFS designated for maintenance of the item. In order to keep crew sizes to reasonable levels, some may indicate that maintenance is to be performed by a related AFS; others may leave it open so that maintenance can be performed by any available airman assigned to the job by the crew chief. If "jet engine maintenance" is designated for performance by AFSC 426x2 (Jet Engine Mechanic), there is a match between the system need and the assigned AFS. It can be assumed that the technician will have demonstrated mastery of certain knowledges typically included in a deductive aid format (e.g., functions, dependencies, signal flow) and that the technician has general knowledge of that equipment item. When such a match exists, selection of a deductive aid may be most appropriate. If, on the other hand, a match is not present, it must be assumed that the technician will *not* have the needed qualifications unless the specific maintenance requirement is part of the qualifications for both AFSs. When there is not a match, a proceduralized aid should be selected.

AFSC 42650
Semiskilled AFSC 42630
Helper AFSC 42610

AIRMAN AIR FORCE SPECIALTY

AIRCRAFT PROPELLER MECHANIC

1. SPECIALTY SUMMARY

Removes, installs, inspects, repairs, and troubleshoots aircraft propellers

2. DUTIES AND RESPONSIBILITIES

a *Disassembles, cleans, and inspects aircraft propellers* Disassembles propellers into component parts such as blades, gears, bearings, brushes, shafts, rollers, hubs, slip rings, separators, covers, pistons, housings, motors, seals, gaskets, bolts, nuts, and washers Cleans and inspects all parts

b *Repairs aircraft propellers and component parts* Troubleshoots and repairs malfunctions found in propellers, governors, sychronizers, feathering pumps, and control systems, using small handtools, such as hammers, pliers, wrenches, and related test equipment Reassembles parts into major propeller assembly and balances propeller by inserting lead into hollow barrel bolts or weights in slots in blade nuts Tests propeller by using electric or hydraulic test stand to check for operation and evidence of oil leakage Operates propeller through full blade angle range Makes necessary corrections such as adjusting stops to agree with prescribed angles to insure efficient operation of propeller

c *Installs propeller and component parts* Removes and installs propeller on engine shaft, using chain fall, propeller slings, and hoist Removes and installs control unit and checks for operation Makes necessary adjustments to propeller and governor synchronizer to insure maximum operating efficiency

d *Supervises aircraft propeller maintenance personnel* Assigns maintenance and repair functions to subordinates and observes performance to insure compliance with procedures and applicable technical publications Instructs subordinates in techniques of installation, repair, and overhaul of aircraft propellers Conducts on-the-job training

3. SPECIALTY QUALIFICATIONS

a *Knowledge* Knowledge of electrical, pneudraulic, and mechanical principles as applied to aircraft propellers, and use of technical publications, forms, records, and maintenance management procedures is mandatory Possession of mandatory knowledge will be determined according to AFR 35-1

b *Education* Completion of high school with courses in general science or mechanics is desirable

c *Experience* Experience in functions, such as installation, repair, or overhaul of aircraft propellers, is mandatory

d *Training* Completion of a basic aircraft propeller maintenance course is desirable

e *Other*

(1) Normal color vision as defined in AFR 160-43 is mandatory

(2) A minimum aptitude level of Mechanical 40 or Electronic 40 is mandatory

4. SPECIALTY DATA

a *Grade Spread*

Airman first-class through staff sergeant	42650
Airman first-class	42650

b *Related D.O.T. Job*

Aircraft-and-Engine Mechanic	621.281

c *Related DOD Occupational Subgroup* 602

Figure 6-10.—Example of AFS Description Providing Specialty Qualifications

Depending on the AFS involved in the match/mismatch, one type of aid may be appropriate for troubleshooting and another for nontroubleshooting. Thus, if maintenance of a turboprop engine is assigned to a jet engine AFS, that person's qualifications should be adequate for nontroubleshooting maintenance of the turboprop propeller system. It is not likely, however, that the same individual will be qualified to troubleshoot and repair the propeller subsystem, since different technologies are involved.

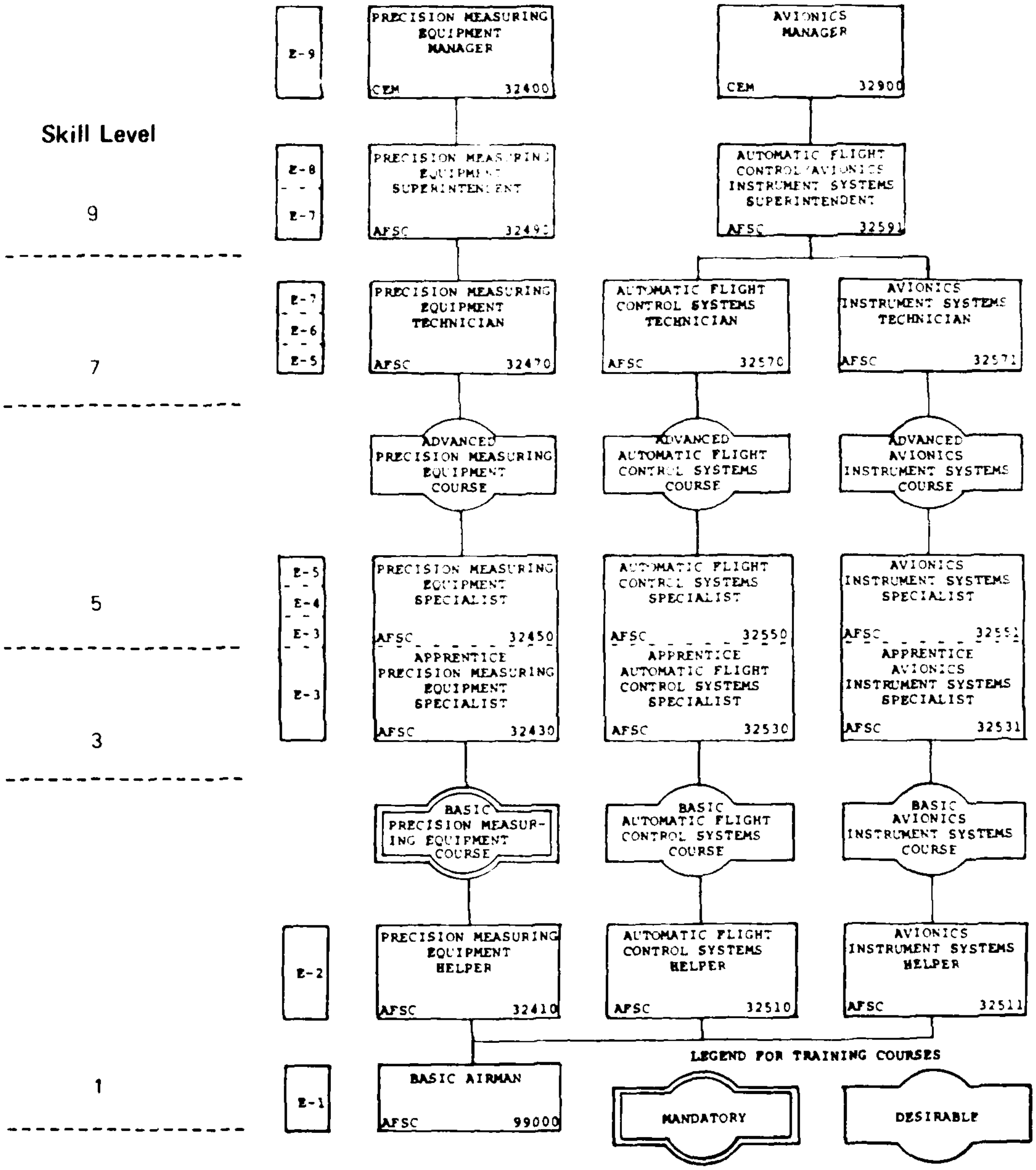
Condition	Variable	Troubleshooting	Nontroubleshooting
AFSQS	Match	Deductive	Descriptive
	Mismatch	Fully proceduralized	Proceduralized

When format selection decisions must be made prior to the availability of AFS data, "best guesses" can often be made on the basis of the mission profile, maintenance concept, etc. In addition, initial decisions may be subject to change if "special training" will qualify the maintenance personnel, even though an AFS mismatch exists.

6.4.6.6 Skill Level: This system condition is closely related to the AFSQS condition, but emphasis is on the career ladder itself (1-, 3-, 5-, 7- skill levels), rather than on a comparison of career ladder qualifications (AFS differences). Figure 6-11 illustrates the career ladders for three related career fields. As the technician gains experience and completes additional training, progress can be made up the career ladder. Table 6-5 identifies the improvements in skills, training, and experience that are deemed necessary to move from one skill level to the next. The lower the skill level of performing or supervising personnel, the greater the need for proceduralized formats.

Condition	Variable	Troubleshooting	Nontroubleshooting
Skill Level	Low	Fully proceduralized	Proceduralized
	High	Deductive	Descriptive

Note also, from examination of Figure 6-11, that the "weight" which is given to the judgment may vary according to the specific career ladder, or AFS. The Precision Measuring Equipment (PME) ladder has a mandatory requirement for completion of the basic PME course in order to progress from AFSC 32410 to AFSC 32430. In the Avionics and Automated Flight System Courses, however, the equivalent basic courses are desirable, not mandatory. It can be expected that not all of the 3- skill levels (or above) in these career fields will have completed the basic course. This distinction can be used to make a judgment between *fully* proceduralized and *partially* proceduralized aids.



AIRMAN AVIONICS SYSTEMS CAREER FIELD CHART

Figure 6-11.–Career Ladders for Precision Measuring Equipment, Automatic Flight Control Systems, and Avionics Instruments

Table 6-5. Criteria for Establishing Skill Levels (AFR 35-1)

CRITERIA FOR AWARD OF AIRMAN AFSCs (See para 6-17d)		
R U L E	A If airman	B then airman is qualified for award of AFSC at
1	is assigned permanent duty or training in helper AFSC, demonstrates potential to progress in ladder, and meets special qualifications for AFS listed in AFM 39-1	1-skill level (note 5)
2	qualifies as bypassed specialist	3-skill level (notes 1 & 5)
3	completes a formal basic or lateral course, or special training designated in USAF Technical Training Program (PTT) as Category R training, and meets requirements in para 3e, specialty description	3-skill level (note 5)
4	has satisfactorily performed in the 3-level AFSC, successfully completes all training requirements; passes AKT or 3-level CDC CE appropriate to AFSC, is recommended by supervisor, and meets mandatory requirements in para 3 e, specialty description	3-skill level (notes 4 & 5).
5	has satisfactorily performed in the 5-level AFSC for a minimum of 6 months, successfully completes all training requirements, is recommended by supervisor, and meets mandatory requirements or equivalents	5-skill level (notes 2, 4 & 5)
6	has satisfactorily performed in the 7-level AFSC for a minimum of 1 year, successfully completes all training requirements including management training required by AFM 50-23, is in grade E-5 or above, is recommended by supervisor; and meets mandatory requirements or equivalents	7-skill level (notes 3, 4 & 5).
7	is promoted to E-8 or selected for promotion to E-8 (note 6)	9-skill level (note 5).
8	is in pay grade E-7; possesses 7-level AFSC, which is normal input source into 9-level AFSC; achieves a qualifying score on the USAFSE; has satisfactorily performed in the 9-skill level AFSC for a minimum of 6 months and is recommended by supervisor	9-skill level (notes 5 & 7).
9	is in grade E-8 or E-9; is retraining outside 9-skill level in which promoted; and has been awarded new AFSC at 7-skill level	9-skill level (note 5).

NOTES: 1. Award of an AFSC as a bypassed specialist normally is restricted to initial classification actions. Award of a semiskilled AFSC as a bypassed specialist subsequent to initial classification will not be made solely as the result of qualification on the AKT, and will be considered in accordance with AFR 39-4.

2. If airman has been retrained from an awarded AFSC at 5 level or above, the 6 months' experience is not required. This exception also applies to reclassified airmen whose specialty was withdrawn for reasons outlined in paragraphs 6-25b(2) and 6-25c through 6-25f.

3. A minimum of 6 months' experience is required for NCOs, grades E-5 through E-7, who have been retrained from awarded 7-skill level AFSCs, or who are returning from Special Duty Identifiers. When change of CAFSC requires termination of upgrade training to the 7-skill level, up to 6 months' of former training time may be applied to the experience requirement for award of 7-skill level in different career ladder. No minimum experience requirements for NCOs, grades E-8 or E-9, who have been trained from awarded 9-skill level AFSC. Applies to reclassified airmen whose specialty was withdrawn for reasons outlined in paragraphs 6-25b(2) and 6-25c through 6-25f.

4. If the training requirement is accomplished through OJT, both parts of the dual channel program must be completed as explained in AFM 50-23.

5. Signature of unit commander or his designated representative required on all classification actions initiated.

6. Must accept promotion to E-8 in order to retain 9-skill level.

7. Six months' minimum performance is not applicable to AFSC 10090.

6.4.7 **EQUIPMENT RELATED CONDITIONS.** As listed in Table 6-4, 10 system conditions relate primarily to the equipment, facilities, and other "hardware" that comprise the system. Six of these conditions are useful predictors of troubleshooting format requirements, and three others of remove/install format requirements. In addition, six conditions affect support requirements in a manner that may indirectly influence choice of format.

6.4.7.1 Testing Technique: This condition relates to troubleshooting MAs and can occur in either of two states: internal or external. An external state occurs when malfunction symptoms are available without shutting down the system and gaining access to its interior parts (i.e., listen to operating sounds, read displays, observe time part movements, etc.). Internal refers to the situations where troubleshooting requires gaining access, locating test points, setting up equipment and interpreting test outcomes, all of which tend to require lengthy and time-consuming troubleshooting sequences.

One state may apply to one part of the system (e.g., external applies to the organizational level of maintenance) while the other state applies to the remainder (e.g., internal for intermediate or depot maintenance). Determining which state applies to which parts of the system is largely a function of hardware features and maintenance analysis results available from design engineering sources.

In considering this condition . . .

Use a proceduralized format where the "internal" technique will be required.

Condition	Variable	Troubleshooting	Nontroubleshooting
Testing Technique	Internal	Proceduralized	No effect
	External	Deductive	No effect

This condition is closely related to two other system conditions, automated test and status displays, which are discussed separately.

6.4.7.2 Equipment Distribution: Job information must be available to the user at the work site. Merely locating equipment to be worked on is often a time-consuming part of the remove and replace actions. This tends to be especially true in cases where the hardware is spread over a considerable area, as opposed to being consolidated in a single location. This condition is likely to affect troubleshooting, since some degree of localization occurs by reason of malfunction reporting. (Exceptions are situations such as fault isolation in an aircraft electrical wiring system.)

Therefore, the guidance for considering this condition is . . .

Consider the proceduralized format where the hardware is spread or dispersed.

Condition	Variable	Troubleshooting	Nontroubleshooting
Equipment Distribution	Consolidated	Minimal effect	Deductive
	Dispersed	Minimal effect	Proceduralized

This condition is closely related to the condition of system size, particularly with regard to the consideration of the support requirements of recording mode and portrayal mode. These factors come into play because of the volume of material to be documented and the need to have applicable portions of that documentation at the work site. The interaction between system size and distribution, as it affects support requirements, is discussed under the size condition.

6.4.7.3 System Size: The size of the information base is related directly to the severity of TM distribution, storage space, and update problems. Since automated nonpaper-based systems* can reduce the severity of these problems in a large system, it is the recommended recording mode. The exact system size at which paper should be abandoned in favor of nonpaper is not established. The following rules of thumb are offered to help establish a recording mode threshold:

Condition	Variable	Access	Recording	Portrayal
Information Base Size	Small (up to 300 frames)	-	Paper	-
	Large (over 1500 frames)	-	Nonpaper	-

In the middle range, additional system conditions, discussed below, are to be used in deciding recording mode. When nonpaper is being considered, the effect of its selection on format must also be considered. Many format alternatives, particularly deductive-type aids, have poor compatibility with the "framing" concept implicit in the use of video display systems.

When the hardware is dispersed, the medium (or portrayal mode) selection is affected as well. The media options to consider for a large, dispersed system are: (1) portable displays and/or (2) centralized displays with printer. A large system with a consolidated layout permits the use of a centralized display without printer.

Condition	Variable	Access	Recording	Portrayal
Size and Distribution	Large Dispersed		Nonpaper	Portable display or printout
	Large Consolidated		Nonpaper	Centralized display

*Automated, nonpaper-based systems may encompass computer-based systems (currently in development, with high potential for effectiveness) in combination with video displays, audio systems, or other nonpaper storage and retrieval media, including microform. Microform is not currently authorized for USAF maintenance TOs.

6.4.7.4 Readiness Impact: Some hardware designs include backup, or alternate, modes of operation. In such cases, primary hardware failures do not put the system "out of commission." Similarly, troubleshooting performed beyond the organizational level does not have immediate, adverse effects on prime system readiness. In other cases, primary hardware failure halts operation of the entire system or jeopardizes mission effectiveness. Similarly, the type of information format to support remove and replace action is influenced by whether the system is "down" during the conduct of the maintenance action. The guidance for considering this condition is . . .

Consider a proceduralized format when the operational system is out of commission during the performance of the action. A deductive format is indicated when there is no immediate impact on readiness.

Condition	Variable	Troubleshooting	Nontroubleshooting
Readiness Impact	System down	Fully proceduralized	Proceduralized
	System operable	Deductive	Descriptive

6.4.7.5 Subordination: The complexity of maintenance actions (MAs) is a critical concern regarding information formats. However, predicting this complexity is very difficult, especially at the early stage of system development when format commitments are required. In this context, hardware subordination, obtained from the topdown breakdown of the system, is a reasonable predictor of MA complexity. Timely and accurate troubleshooting is possible with the deductive format assuming that the technician, no matter how inexperienced, has received some training, and that the nature of the troubleshooting is not too complex. Equipment with a subordination greater than one in ten (a judgment value) is assumed to pose complex troubleshooting problems.

In considering this hardware oriented condition . . .

Use the proceduralized format when troubleshooting involves isolation of one to more than 10 subordinate units. Use a deductive aid when fewer than five subordinate units are involved.

Condition	Variable	Troubleshooting	Nontroubleshooting
Subordination	Complex (>10)	Proceduralized	No effect
	Simple (<5)	Deductive	No effect

When considering proceduralized formats, the topdown breakdown should be reviewed carefully to ensure that an apparently large subordination (>20) is valid. Such a condition is sometimes an artifact, the result of improper consideration of functions. For example, Figure 6-12(a) lists 54 piece parts which make up a "Flow Transmitter," indicating a 1:54 subordination. However, 1:4 is a more reasonable subordination, as indicated in the Topdown Breakdown in Figure 6-12(b), which shows the subordination of functions to the probable level of troubleshooting.

[illegible]em 4A B Model 53N Flow Transmitter with Variable Element Drawing 539876				
14	[illegible]aphragm Plate Assembly	1	3	138551
15	[illegible]aphragm	1	3	93511
16	[illegible]aphragm Seat	1	3	138547
[illegible]	[illegible]onnecting Rod	1	3	138548
19	[illegible]Ring	1	3	120039-8
20	Spring	1	3	S 159
21	Cam Mounting Bracket	1	3	338570
23	Cam Roller Lever Assembly	1	3	183552
24	Ball Bearing	5	15	122548
25	Retaining Ring	2	6	120133 3
27	Spacer	2	6	138561
28	Spacer	1	2	138562
32	Bearing Pin	2	6	138558
33	Retaining Ring	4	12	120140 9
34	Flow Cam	1	3	138576
36	[illegible]evis	1	3	138544
37	[illegible]ing	1	3	138545
39	[illegible]ing Spring	1	3	138562
40	[illegible]ing Spring	1	3	3 381
41	Escapement Valve Body	1	3	10303 5
42	[illegible]e Stem	1	3	10303 6
43	[illegible] Nut	1	3	10303 7
44	Valve Seat	1	3	10303 8
45	[illegible]asket	1	3	10303 10
48	Beam Assembly	1	3	341250
49	[illegible]ring Adjustment Assembly	1	3	140971
50	Nut	1	3	140874
[illegible]	Valve Spring	1	3	S 321
53	No 6 32 Elastic Stop Nut	2	6	120033 1
60	Adjustment Screw	1	3	140987
61	Adjustment Screw	1	3	142181
[illegible]	Ze[illegible] Spring	1	3	148622
64	Thrust Plat[illegible]	1	3	142399
65	Reta[illegible]ing Ring	1	3	142400
66	[illegible]asket		3	142401
90	[illegible]wer [illegible]aphragm Plate Assembly	1	3	246706
[illegible]	[illegible]side [illegible]aphragm Plate	1	3	346704
[illegible]	Bellows Assembly	2	6	146890
[illegible]	[illegible]asket	2	6	141245
94	[illegible]asket	2	6	141242
99	[illegible]asket	1	3	141241
[illegible]	[illegible] Pin	1	3	141256
96	Spacer	2	6	138229
[illegible]	[illegible] Bearing	2	6	138251
98	Retaining Ring	2	6	120133 2

Figure 6-12(a). -Part Breakdown from Current TM (Ref. 24)

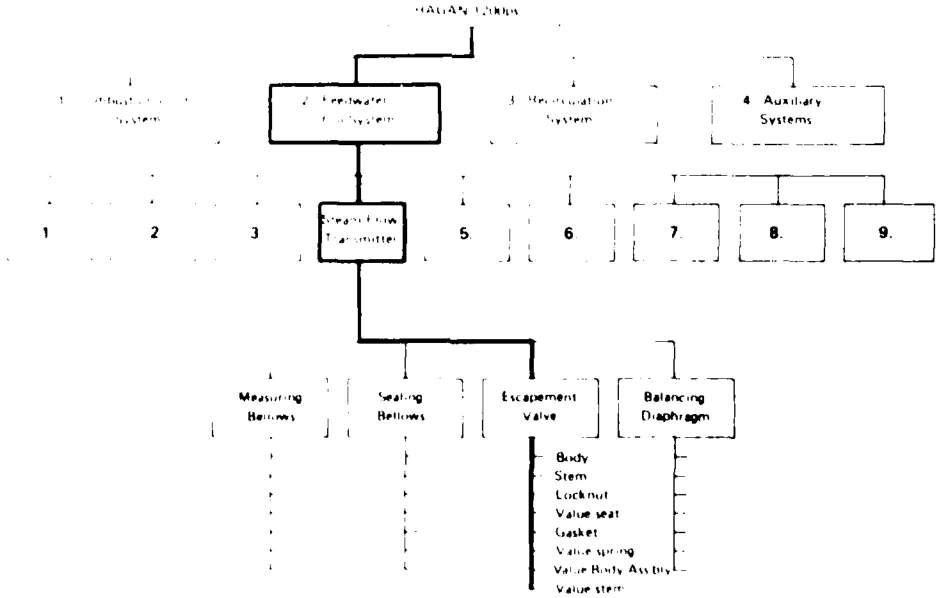


Figure 6-12(b). Topdown Breakdown (Partial) (Ref. 24)

6.4.7.6 Maintenance Demands: A maintenance organization can receive its unscheduled workload in either of two ways: (1) batch source, where many maintenance actions can and usually do arrive in a short period of time, or (2) single event source, where corrective maintenance needs are usually the result of a single system failure. The batch source is usually associated with multiple systems, e.g., several aircraft returning from flights maintenance input to a repair shop. When a batch condition exists, especially in concert with inexperienced personnel, maintenance queues can build up, viz., equipment awaiting maintenance for lack of personnel. Innovative formats are especially appropriate for the batch condition, but not as necessary in the alternate condition where unscheduled workload results from single system failures. The guidance for considering this condition is . . .

A batch source workload tends to require the proceduralized format, whereas the single input source allows the deductive format.

Condition	Variable	Troubleshooting	Nontroubleshooting
Maintenance Demands	Batch source	Proceduralized	Proceduralized
	Single event	Deductive	Descriptive

Scheduled maintenance, since it is predictable, is always considered as a single-event maintenance demand. However, see the guidance in paragraph 6.4.4.3 regarding periodic maintenance.

6.4.7.7 Replication: The number of systems to be installed influences the selection of a recording mode. When a large number of systems are installed, distribution problems occur which nonpaper media* tend to counter. On the other hand, the distribution of new TMs and changes is not a severe problem when only one or a few systems will be installed. Therefore, system size and replication exert reinforcing influences on the recording mode; that is, a system with many replications tends to warrant the nonpaper* recording mode, while a system with a few replications tends to permit the paper or book mode. Format selection may be indirectly influenced by this condition, since some formats are less compatible with nonpaper than are others.

Condition	Variable	Access	Recording	Portrayal
Replication	Many		Nonpaper	
	Few		Paper	

6.4.7.8 Installation Context: The context in which a system is installed relates to the recording mode used to store its TM information. This condition is especially important for small systems that may not qualify for use of nonpaper media* unless the cost and capacity of the equipment can be shared with other systems. Therefore, it is necessary to determine whether a system's installation context will be "isolated" or in the proximity of other systems.

*See note on page 163.

Most equipment tends to operate in a multi-system context, such as in a maintenance hangar installation. In these situations, "adjoining" systems may share the cost and capacity of a nonpaper* recording mode, thereby translating two or more small systems into the equivalent of a large system. When a small or mid range system operates independently of other systems, a paper recording mode is to be considered.

Condition	Variable	Access	Recording	Portrayal
Installation Context	Isolated		Paper	
	Associated		Nonpaper	

6.4.7.9 Automated Test Equipment (ATE): This condition is closely related to the testing technique condition discussed above, and has a direct influence on the support requirement of access. ATE occurs most frequently in electrical electronic equipment. When present, a listing of ATE outcomes is required to access troubleshooting (or possibly repair) instructions, regardless of the format used. A format that keys ATE readouts to the appropriate job aids is depicted in Figure 6-13.

Condition	Variable	Access	Recording	Portrayal
Automated Test Equipment	Present	Cross-reference		
	Absent	No effect		

6.4.7.10 Status Displays: This condition, like ATE preceding, is closely related to the testing technique condition. Status displays are present most frequently in electronic electrical equipment, although hydraulic, pneumatic, and other flow systems possess the trait to a lesser degree. When displays are present, a listing of status displays is appropriate to access troubleshooting aids. When numerous displays are present, it may be advisable to consider a decision logic table as opposed to a list, since *patterns* of display readings are more useful points of departure for troubleshooting. The decision logic table format is illustrated in Figure 6-14.

Condition	Variable	Access	Recording	Portrayal
Status Displays	Present	List or DLT		
	Absent	No effect		

---

*See note on page 163.

BIT TEST	FIGURE	BIT TEST	FIGURE
001	7-1	025	7-9
004	7-2	026	7-9
005	7-2	029	7-9
006	7-2	031	7-9
007	7-2	032	7-10
008	7-2	033	7-10
009	7-2	034	7-10
010	7-2	035	7-10
011	7-2	036	7-11
012	7-2	037	7-11
012 13	7-3	038	7-11
013	7-3	039	7-11
014	7-4	042	7-11
015	7-5	043	7-11
016	7-6	044	7-11
017	7-7	045	7-11
018	7-7	050	7-11
019	7-7	051	7-11
020	7-8	054	7-11
021	7-9	055	7-11
022	7-9		

Figure 6-13. Access to Troubleshooting Aids via Built-in Tests, Sample Format (Ref. 24)

Display Readout	Symptom Patterns															
PWR SUPPLY OK	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
MASTER CLOCK OK	N	N	N	N	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y
TRANSMITTER OK	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y
RECEIVER OK	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
ENTIRE SYSTEM BAD;	X															
GO TO INTERFACE																
DO PWR SUPPLY CK		X	X	X	X	X	X	X								
DO MASTER CLOCK CK		X	X	X					X	X	X	X				
DO TRANSMITTER CK		X			X	X			X	X			X	X		
DO RECEIVER CK			X		X		X		X		X		X		X	
ENTIRE SYS OK																X

Indexed Aids

Figure 6-14. Sample of a Decision Logic Table Format for Using Status Displays to Index Aids (Ref. 24)

6.1.8 ENVIRONMENT RELATED CONDITIONS. Four of the system conditions listed in Table 6-4 relate to the environment in which maintenance tasks must be performed. Although several of these conditions have an indirect influence on format selection, the primary consideration is the effect on the portrayal mode support requirements. When these conditions are being considered, the scope should include both principal worksite (at each maintenance level) and any alternate working conditions for which planning is being accomplished for the system. Examples might include remote sites, shelters, unsheltered ramp areas, missile silos, etc.

6.1.8.1 **Cleanliness:** Soil, grime, dust, grease, and other types of dirt can be expected at many maintenance locations, either from the ambient environment or from the equipment on which maintenance is being performed. The principal effect of this condition is on hard copy TMs, the pages of which can rapidly become soiled. This can result in the obscuring of essential instructions, diagrams, data tables, etc., leading to performance delays at best, and performance errors at worst. When such conditions can be anticipated in conjunction with the use of hard copy TMs, consideration should be given to the use of special paper that will resist soiling and/or can be wiped clean.

Condition	Variable	Access	Recording	Portrayal
Cleanliness	Dirt, Grease			Laminated coating
	No dirt			Plain paper

6.1.8.2 **Working Space:** Many maintenance actions must be performed where working space is very limited, such as inside some compartments in an aircraft fuselage. Although improvements in human engineering design and maintainability design have reduced the frequency of such problems, some are inevitable. Since the maintenance technician must still be able to have TMs at the job site, limited workspace imposes a requirement for special consideration for the size and packaging of the media used to portray the instructions. If microform presentation is being planned, portable, miniaturized viewers should be provided. If paper TMs are planned, "pocket-sized" manuals should be provided, and the work package approach should be fully utilized.

Condition	Variable	Access	Recording	Portrayal
Working Space	Limited			Small manuals or viewers
	Non-limited			No effect

Provision of reduced size TMs for this circumstance may also influence format selection, particularly for troubleshooting activities. Legibility will be affected by the reduced size, and foldouts (for large diagrams) may be impractical. In addition, care must be exercised that task instructions do not require multi-technician activity when there will only be sufficient working space for one.

6.4.8.3 Illumination: This factor frequently accompanies that of limited workspace, although it often must be considered even when workspace is adequate. Variables are more complicated than in some other conditions, since not only the level of illumination must be considered, but also whether or not glare will be present. If working conditions will include darkness or low levels of illumination, use nonpaper-based systems* requiring no external illumination, or provide auxiliary lighting for hard copy manuals. If glare can be expected, displays should be hooded or use glare-reducing screens, and hard copy manuals should use paper with a dull finish.

Condition	Variable	Access	Recording	Portrayal
Illumination	Dark	–	–	Auxiliary or self-illuminated
	Bright	–	–	No effect
	Bright, with glare	–	–	Hoods, or matte paper

6.4.8.4 Elements: This condition can include precipitation (rain or snow), temperature, wind, humidity, etc. The presence of rain, sleet, and snow has its greatest effect on TMs in the choice of portrayal media, where provisions to protect the pages of hard copy TMs must be made. Whenever wet conditions can be anticipated, pages should have a laminated coating.

Condition	Variable	Access	Recording	Portrayal
Elements	Wet	–	–	Laminated paper
	Dry	–	–	No effects

6.4.9 OTHER ACCESS REQUIREMENTS AND TECHNIQUES. Difficulty in locating information causes much of the technician's frustration with conventional TMs. For example, research (*Ref. 24*) shows that with conventional tables of contents and indexes, technicians spend 5 percent of their job time unsuccessfully seeking TM information. They then spend *an additional 12 percent* of their job time obtaining guidance from other workers and supervisors. A more recent survey (*Ref. 125*) reports that over one-fourth of the respondents indicated they spent 25 to 49 percent of their total job time seeking information in TOs, while more than one-fifth reported spending more than 50 percent of their job time seeking information in TOs. In too many cases, poor access forces the technician to rely on fallible, non-TM sources for job guidance.

Resolving this issue involves application of access techniques that apply to *all* systems as well as the selected use of techniques that apply only in certain circumstances, e.g., with Automated Test Equipment and displays.

*See note on page 163.

General Recommendations: Certain access techniques are universal and should be used in all TMs. These are discussed below.

a. *Work Package.* A work packaging approach segments a system into a number of "mini" systems, each of which can have its own mini manual or work package. Initial access is thus simplified by an alphabetical listing of work packages, rather than an excessively detailed table of contents. A "local" table of contents provides within-package access to maintenance information, e.g., troubleshooting, parts listings, system description. Note that the work packaging approach discussed here is related conceptually to the WORKPAC JPA System (see AFHRL TR 80 50, Section 4) but should not be confused with it.

b. *Periodicity Schedules.* Most equipment requires regular checks and inspections. The periodic scheme illustrated in Figure 6-15 is an appropriate means of accessing job instructions for periodic maintenance.

c. *Symptom Indexing.* Troubleshooting or repair instructions are needed as a direct result of system malfunction indicated by the presence of abnormal symptoms. Symptoms can be uncovered during regular checks or during operation. Regardless of their source, they occur in the form of either automated test readouts and status displays (see paragraphs 6.4.7.9 and 6.4.7.10) or symptoms not displayed formally. The lack of displays or ATE readouts requires that the symptoms be couched in other observable terms, e.g., sounds, movements, timing, or occurrence or non occurrence of events. Figure 6 16 presents an illustrative listing of symptoms suitable for meeting this access need.

d. *Internal Access.* Internal access refers to the need for "follow on" maintenance; e.g., a preventive action may uncover the need for troubleshooting, and troubleshooting should then indicate the need for repairs. Internal reference should be provided in an overview format (Figure 6 17) or a "refer to" format (Figure 6 18). The use of internal accessing is further illustrated in AFHRL TR 80 50, Section 4 (Figures 4-4, 4 7, and 4 11).

6.4.10 SELECTION GUIDELINES SUPPORT. The format selection guidelines in AFHRL TR 80 50, Section 6 utilize an analytical and documentation tool called FOSDIC tables. These include the basic FOSDIC table (Figure 6 19), and partially completed FOSDIC TS (Figure 6 20) and FOSDIC NTS (Figure 6 21) tables for troubleshooting and non-troubleshooting, respectively. These blank versions of the FOSDIC tables are included here for reference, and may be locally reproduced as required.

In addition, for the TO Specialist who wishes to follow the logic of the FOSDIC guidelines, but needs to consider all of the potential system conditions as well as support requirements, a set of tables related to the FOSDIC process is included as Figures 6 22 through 6-25.

Finally, a blank copy of the MAFOSS table, for summarizing the format option selection, is included as Figure 6 26.

Interval/Requirement	MRC #
Condition Checks	
Hot Start	114.1 - 114.4
Hard Landing	62.0 - 70.6
100 Arrested Landings	
etc.	
Preflight	
Postflight	
Interval Checks	
Daily	200.0 - 210.0
14 days	800.0 - 820.0
28 days	

Figure 6-15.—Sample of Periodicity Index for Scheduled Inspections (Ref. 24)

SYMPTOM INDEX

	Troubleshooting Procedure
COOLING SYSTEM	
Radiator	
Boils over	3-12
Leaks.	3-17
Temperature Gage	
No indication	3-29
Runs cold	3-11
Runs hot	3-13
ENGINE	
Misses	3-34
Overheats	3-72
Won't start	3-27
EXHAUST SYSTEM	
Excessive smoke	3-33
Water vapor	3-33

Figure 6-16. -Sample Format for Indexing for Mechanical Equipment (Ref. 24)

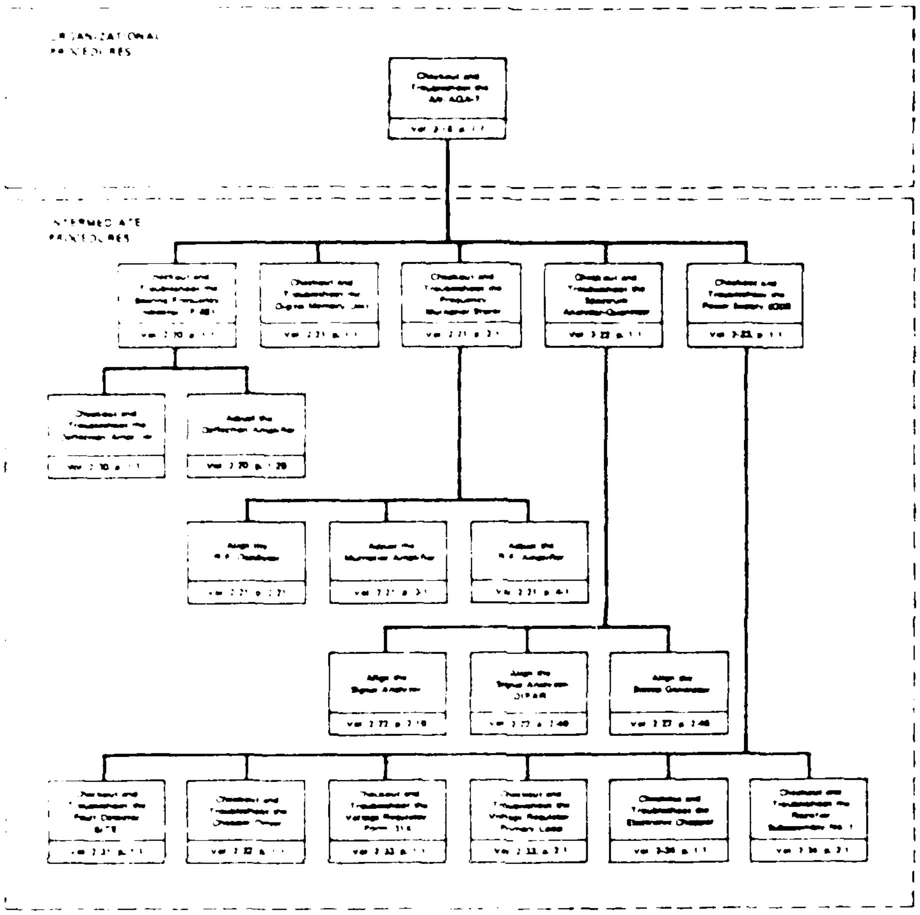


Figure 6-17.—Sample of Overview Format for Follow-on Maintenance (Ref. 24)

NOTE
Follow-on Maintenance Action Required: "Install Main Driveshaft" (Vol. 12, p. 4-1)

Figure 6-18.—Sample of "Refer to" Format for Follow-on Maintenance (Ref. 24)

FOSDIC

FORMAT OPTION SELECTION DEPENDING ON INTERACTION OF CONDITIONS

MAINTENANCE LEVEL	MAINTENANCE ACTION
• Organizational ______	• Troubleshoot ______
• Intermediate ______	• Non troubleshoot ______
• Depot ______	• Special ______
• Other ______	

TOPDOWN BREAKDOWN

2

3

4

System Con[illegible]	Maintenance Level			Personnel Turnover		Time To Proficiency		AFSQS		Skill Level		Testing Technique		Readiness Impact			
Variable	Organizational	Intermediate	Depot	Low	High	Short OJT	Long OJT	Match	Mismatch	Low	High	Internal	External	Down	Operable		
Format Options	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S

Code				
Date				
Preparer				
Result				
F	P	L	S	•

F Fully Proceduralized, P Partially Proceduralized, L Logic Deductive, S System Descriptive

Figure 6.19. Basic FOSDIC Table for Format Option Selection

FOSDIC –TS FORMAT OPTION SELECTION DEPENDING ON INTERACTION OF CONDITIONS

MAINTENANCE LEVEL	MAINTENANCE ACTION
• Organizational ____	• Troubleshoot ✓ ____
• Intermediate ____	• Non-troubleshoot ____
• Depot ____	• Special ____
• Other ____	

TOPDOWN BREAKDOWN

2

3

4

System Condition	Maintenance Level			Personnel Turnover		Time To Proficiency		AFSOS		Skill Level		Testing Technique		Readiness Impact			
Variable	Organizational	Intermediate	Depot	Low	High	Short OJT	Long OJT	Match	Mismatch	Low	High	Internal	External	Down	Operable		
Format Options	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S

Code	
Date	
Preparer.	

Result				
F	P	L	S	•

F Fully Proceduralized, P Partially Proceduralized, L Logic Deductive, S System Descriptive

Figure 6-20.— FOSDIC-TS Table for Troubleshooting Format Option Selection

FOSDIC -NTS

FORMAT OPTION SELECTION DEPENDING ON INTERACTION OF CONDITIONS

MAINTENANCE LEVEL	MAINTENANCE ACTION
• Organizational ____	• Troubleshoot ____
• Intermediate ____	• Non-troubleshoot ____
• Depot ____	• Special ____
• Other ____	

TOPDOWN BREAKDOWN

1
2
3
4

System Conditions	Maintenance Level			Personnel Turnover		Time To Proficiency		AFSCS		Skill Level		Testing Technique		Readiness Impact				Code
Variable	Organizational	Intermediate	Depot	Low	High	Short OJT	Long OJT	Match	Mismatch	Low	High	Internal	External	Down	Operable			Date / Preparer
Format Options	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	F P L S	Result: F P L S •

F - Fully Proceduralized, P - Partially Proceduralized, L - Logic Deductive, S - System Descriptive

Figure 6-21. - FOSDIC-NTS Table for Non-troubleshooting Format Option Selection

MAINTENANCE ACTION SYSTEM CONDITIONS OPTIMIZATION TABLE (MASCOT)

EQUIPMENT						MAINTENANCE LEVEL	MAINTENANCE ACTION	
						Support Requirements		
System Condition	Variable	Fully Proceduralized	Partially Proceduralized	Logic Deductive	System Descriptive	Access	Recording	Portrayal

Figure 6-22.—Basic MASCOT Table

MAINTENANCE ACTION SYSTEM CONDITIONS OPTIMIZATION TABLE (MASCOT)

EQUIPMENT						MAINTENANCE LEVEL	MAINTENANCE ACTION • Troubleshoot X	
						Support Requirements		
System Conditions	Variation	Fully Proceduralized	Partially Proceduralized	Logic Deductive	System Descriptive	Aids	[illegible]	[illegible]
[illegible]	[illegible]	X		X	X			
[illegible]	[illegible]	X		X	X			
	[illegible]			X	X			
	[illegible]			X	X			
	[illegible]			X				
	[illegible]			X				
	[illegible]							
	[illegible]						[illegible]	[illegible]
				X	X			
[illegible]	[illegible]			X	X			
[illegible]	[illegible]							
[illegible]	[illegible]							[illegible]
[illegible]	[illegible]	See Test		Technique		[illegible]		
	[illegible]	See Test		Technique		[illegible]		
[illegible]	[illegible]	See Test		Technique		[illegible]		
	[illegible]	See Test		Technique		[illegible]		
[illegible]	[illegible]						Paper [illegible]	
[illegible]	[illegible]						[illegible] Paper	
[illegible]	[illegible]						Paper [illegible]	
[illegible]	[illegible]							[illegible] Laminated
[illegible]	[illegible]							[illegible] paper
[illegible]	[illegible]							Laminated paper [illegible]

Figure 6-23. -MASCOT Table for Troubleshooting MAs

MAINTENANCE ACTION SYSTEM CONDITIONS OPTIMIZATION TABLE (MASCOT)

EQUIPMENT						MAINTENANCE LEVEL	MAINTENANCE ACTION • Remove Insta[illegible]	
						Support Requirements		
System Condi[illegible]	Variati[illegible]	Fully Proceduralized	Partially Proceduralized	Logic Diagram Type	System D[illegible] Type	A[illegible]	Re[illegible]	P[illegible]
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]						[illegible]	[illegible]
[illegible]	[illegible]							
[illegible]	[illegible]							
[illegible]	[illegible]							[illegible]
[illegible]	[illegible]						[illegible]	
[illegible]	[illegible]						[illegible]	
[illegible]	[illegible]						[illegible]	
[illegible]	[illegible]							[illegible]
[illegible]	[illegible]							[illegible]
[illegible]	[illegible]							[illegible]

Figure 6-24. MASCOT Table for Remove/Install MAs

MAINTENANCE ACTION SYSTEM CONDITIONS OPTIMIZATION TABLE (MASCOT)

EQUIPMENT						MAINTENANCE LEVEL	MAINTENANCE ACTION • Special Case	
						Support Requirements		
System Condition	Value	[illegible]	[illegible]	[illegible]	[illegible]	A[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	See Test		Technique				
[illegible]	[illegible]	See Test		Technique				
[illegible]	[illegible]	See Test		Technique				
[illegible]	[illegible]	See Test		Technique				

Figure 6-25. MASCOT Table for Special Case MAs

MAINTENANCE ACTION FORMAT OPTION SELECTION SUMMARY

Code ____________

Prepare ____________

Date ____________

MAINTENANCE LEVEL	MAINTENANCE ACTION
• Organizational ______	• Troubleshoot ______
• Intermediate ______	• Non-troubleshoot ______
• Depot ______	• Special ______
• Other ______	

TOPDOWN BREAKDOWN

	FORMAT OPTION					SPECIAL REQUIREMENTS
	FP	PP	[illegible]	S[illegible]	•	

LEGEND

- • Preferred
- Required
- ✓ Acceptable
- Substitute
- [illegible] Dual Level

F.O. Selection ____________

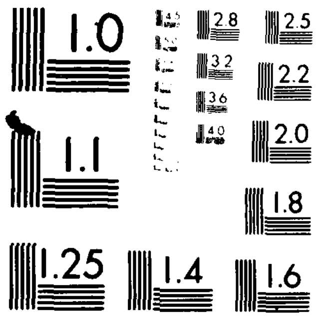
Format Selection ____________

Figure 6-26. MAFOSS Table for Summarizing Format Option Selection

AD-A099 779 BIOTECHNOLOGY INC FALLS CHURCH VA F/G 5/1
TECHNICAL ORDER MANAGERS REFERENCE DATA.(U)
MAY 81 G R HATTERICK, H E PRICE F33615-78-C-0016

UNCLASSIFIED AFHRL-TR-80-51 NL

3 of 4



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

SECTION 7. REQUIREMENTS AND GUIDELINES DOCUMENTS FOR THE ACQUISITION AND PREPARATION OF TECHNICAL MANUALS

This section provides a comprehensive listing of requirements and guidelines documents which are available for use in the preparation and acquisition of technical manuals and related data. It has been compiled from a variety of sources and is the most complete listing available. Any publication which is known to contain relevant requirements has been included, even though (in some instances) the accuracy of the entries could not be verified.

Publications of the following types are included:

The categories of data which are included in these tables, in the columns from left to right, are explained as follows:

REQUIREMENTS AND GUIDELINES DOCUMENTS

Number and Revision The official publication number, as assigned by the issuing organization, including revision letters and part numbers as applicable. Does not include change or amendment numbers.

Subject The subject of the publication, expressed in clear English. Where possible, the first word is the key *item or topic* to which the requirements or guidelines apply. Words such as "Manual" or "Technical Manual" are not included unless necessary for subject clarity.

Latest Issue Date The month and year of the most recent issue, revision, change, amendment, etc., which could be confirmed. Publications which are revised or reissued on a regular and frequent basis are noted by letter codes.

FSC (Federal Supply Code) Symbols indicate whether the requirements document is directly related to technical manuals.

SERVICE APPLICABILITY Symbols indicate the extent to which the document is authorized, by and for DOD and the military services, for use in preparing, acquiring, or maintaining technical manuals.

EQUIPMENT Symbols indicate, for six categories of systems, the applicability of the requirements documents. The categories are not mutually exclusive.

MANUAL TYPE Symbols indicate the applicability of the requirements to operation and or maintenance manuals. Instructions for operating test equipment and for turn on shut down preparatory to maintenance are considered maintenance manuals.

REQUIREMENTS Symbols indicate whether the requirements and guidelines are applicable to the preparer and or the acquisition manager. Preparation requirements are categorized as follows:

Analysis Requirements for conduct of certain kinds of analysis (e.g., "front-end analysis," "task analysis," etc.) prior to starting preparation of procedures.

Style/format Requirements for general style, format (e.g., organization), writing reading level, word lists, etc.

Content Requirements for specific kinds of technical information to be included in the manual.

Quality Assurance Requirements for reviews, validation, and/or verification of technical manuals.

Acquisition guidelines include requirements for planning and decisionmaking by the TO Manager (e.g., "Ordering Data," approval requirements, etc.). The last subcolumn, JPA Format Options, indicates whether the document contains requirements relative to one or more JPAs for "formats," as defined in this handbook. Specific Formats are cross-referenced to the applicable requirements documents in AFHRL-TR-80-50, Section 6.

REFERENCE NOTES Numbered reference notes provide further information relevant to one or more entries on that line. Notes begin on page 184.

EXPLANATION OF SYMBOLS AND LETTER CODES Codes and symbols used in the tables are explained on page 186.

REFERENCE NOTES

1. For explanation of column headings and symbols used, see page 182 and 186.
2. MIL-M-7700C supersedes: MIL-M-007700B.
3. Cancelled; date unknown; superseding document, if any, unknown.
4. MIL-M-38800 supersedes: MIL-M-9864.
5. MIL-M-38812 supersedes: MIL-M-38789 (partially); MIL-M-26788 (partially).
6. MIL-M-38784 supersedes: MIL-M-0053474D; MIL-M-4410; MIL-M-38730; MIL-M-0038784.
7. JPA Format Option requirements are in a companion document (MIL-HDBK-63038-1), which is included by reference.
8. Current issue not available; data entries based on review of earlier issue.
9. Document not reviewed; data entries based on other source material.
10. MIL-M-85025(AS) supersedes prior specifications or other documents used to prepare NATOPS Flight Manuals; identification of superseded documents not provided.
11. MIL-M-008910A supersedes: MIL-M-8910 (for Navy).
12. MIL-M-38807 supersedes: MIL-M-8910 (for USAF).
13. This document carries *multiservice designations*, such as: AFLC/AFSCR 800-24; DARCOM-R 700-97; NAVMATINST 4000.38; MCO P4110.1A.
14. AFLCM 81-1 and AFSCM 81-1 are published as a combined document, AFLC/AFSCM 81-1.
15. AFLCR 8-3 and AFSCR 8-3 are published as a combined document, AFLC/AFSCR 8-3.
16. MIL-M-83499 supersedes: MIL-M-4410.
17. MIL-M-83931 supersedes: MIL-M-4410.
18. MIL-M-38797 supersedes: MIL-M-6261; MIL-H-6757; MIL-H-7257; MIL-H-7960; MIL-M-9848.
19. MIL-M-38798 supersedes: MIL-M-138798B.
20. MIL-M-63036 supersedes: MIL-M-63047.
21. MIL-M-9901 supersedes: *MIL-M-9889; MIL-M-9899; MIL-C-9905.*
22. MIL-M-38701 supersedes: MIL-M-009210.
23. MIL-M-81927 supersedes: AR-75.
24. MIL-M-81928 supersedes: AR-76.
25. MIL-M-81929 supersedes: AR-78.
26. MIL-M-81748 supersedes: NAVAIR 00-51C-500.
27. Section 8 contains a cross reference between AFADs and the included specifications imposing TO requirements.
28. AFR 36-1 supersedes AFM 36-1; AFR 39-1 supersedes AFM 39-1.

29. This document carries *multiservice designations such* as AFR 66-19; AR 310-70; NAVMAT-INST 5600.11A; MCO 5215.16; DSAR 4151.9.

30. This document carries multiservice designations such as: AFR 74-15; AR 702--4; NAVMAT-INST 4355.69A; MCO P4855.4A; DSAM 8200.1.

31. Although listed as a TMSS specification in DODISS, MIL-P-22203 (AER) technical data is engineering-oriented and is not for use in TMs; it *must* be *compatible* with Flight Manuals, however.

32. This *non*-TMSS or cancelled document is included in this listing because of its incorporation by reference in a TMSS-type specification which is active.

33. MIL-M-24570 supersedes: Navy Pub. XWS-17917A.

34. MIL-M-38801 supersedes: DI-H-104.

35. MIL-M-25394 supersedes: MIL-M-4884; MIL-H-5469A; MIL-H-7985.

36. MIL-M-63018A supersedes: MIL-M-38792A.

37. Requirements are contained in the included specifications and standards; applicable requirements documents are presented in this Table.

38. Technical Orders containing operation and maintenance procedures are excluded from this listing even though they may be listed as applicable documents in TMSS specifications.

39. Standards of the American National Standards Institute (ANSI) were formerly designated USA Standards (USAS); some specifications still list USA Standards as applicable documents.

40. The following documents are *Draft* requirements documents and *should not be used for* procurement purposes *without prior authorization:* AFHRL-TR-73-43(I); MIL-M-630XX; MIL-M-632XX-1; MIL-M-632XX-2; AFHRL TR-79-49; AFHRL TR-79-50.

41. The following documents provide guidance in the areas indicated, but are not specification-type requirements documents: AFHRL-TR-73-43(II); AFHRL-TR-73-43(III).

42. MIL-M-38793 supersedes: MIL-M-63037(?); MIL-M-23695; MIL-C-24133; MIL-M-9923A.

43. The supersession data of Note 42 pertaining to MIL-M-63037 is believed to be in error.

44. AFLCM 400-4 and AFSCM 400-4 are published as a combined document: AFLCM/AFSCM 400-4.

45. MIL-C-005011B is *used* by USAF *in* lieu of MIL-C-5011A.

46. AFLCM 310-1, V.2 *and* AFSCM 310-1, V.2 were published as a combined document, AFLC/AFSCM 310-1, vol. 2; it has been superseded by AMSDL, also known as TD-3.

47. AFP 13-2 supersedes: AFP 10-1.

48. MIL-M-630XX, MIL-M-632XX-1, *and* MIL-M-632XX-2 have not been released as official specifications, and thus have not been oficially superseded. In general, however, they have been *replaced* by MIL-M-63035, MIL-M-63036, MIL-M-63037, MIL-M-63038, MIL-M-63040, MIL-HDBK-63038-1, and MIL-HDBK-63038-2.

EXPLANATION OF SYMBOLS & CODES

REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICA-BILITY				EQUIPMENT						MAN-UAL TYPE		REQUIREMENTS						REFERENCE NOTES
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	PREPARER: ANALYSIS	PREPARER: STYLE/FORMAT	PREPARER: CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	
Issue Date	Month & year of most recent issue known	11/78																				
	Revised monthly	M																				
	Revised quarterly	Q																				
	Revised annually	A																				
	Revised frequently but irregularly	F																				
Federal Supply Code (FSC)	TM Spec/Std (TMSS) or equivalent		T																			
	Non TMSS, but related thereto		•																			
Service Applicability	Mandatory for use by all military dep'ts of DOD			◆																		
	Approved for use by all military dep'ts of DOD			◇																		
	Coordinated doc't. Authorized by & for				●	●	●															
	Limited coordination doc't. Authorized by & for						○															
	Supplement to basic document preceding						☆															
Requirements Applicability	Explicit requirements applicable to							▲					▲		▲	▲	▲	▲	▲		▲	
	General requirements applicable to								△		△			△	△		△	△		△	△	
	Requirements applicable to checklists																				C	
	Independent of type of equipment/manual							@	@	@	@	@	@	@	@							
Other	Cancelled or superceded, see reference note				⊕			⊕							⊕		⊕	⊕			⊕	
	Unknown or unconfirmed data, data from reference source	?	?			?						?			?	?					?	
	See Reference Note # for additional information																					32
	Draft Document, see reference note for status							■								■						

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NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	ESC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C F M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	PA FORMAT OPTIONS	REFERENCE NOTES
REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS: PREPARER						
MILITARY HANDBOOKS (MIL-HDBK)																						
MIL HDBK 242	Writer's Guide for MIL M 24100B Functionally Oriented Maintenance Manuals (FOMM)	10/74	T	◇		●	●	@	@	@	@	@	@	▲	▲		▲	▲	△		▲	
MIL HDBK 63038-1	Technical Manual Writing Handbook	5/77	T	◇		●		@	@	@	@	@	@	@	@		▲	▲			▲	48
MIL HDBK 63038-2	Technical Writing Style Guide	5/77	T	◇		●		@	@	@	@	@	@	@	@		▲					48
MIL HDBK 275A	Flight Vehicles & Components Lubricants, Fluid & Compounds Selection Guide	6/76	•		●	●	●															32.9
MILITARY SPECIFICATIONS (MIL-x)																						
MIL-P-116G	**Methods of Preservation**	8/77	•		●	●	●															32.9
MIL-T-3817	**Time Compliance Technical Orders**	?	?		⊕					⊕								⊕				9.3.32
MIL M 4410E	Title Pages, Page Lists, Repro. Assemb. Sht., Negatives Printing & Binders	5/67	?		⊕																	6.16.9 17.32
MIL-C 5011A	Piloted Aircraft Standard Aircraft Characteristics & Performance	11/51	•		⊕		●															32.45.9
MIL W 5013H	Aircraft Wheel & Brake Assemblies	9/71	•		●	●	●	△														32.9
MIL M 5096D	Aircraft, Air Launched Missiles, Rockets, Drones & Support Equipment - Inspection & Maintenance, Inspection & Lubrication Work Cards, Acceptance & Functional Check Flight Procedures, Functional Check Flight Check lists, Inspection Sequence Charts	4/78	T					▲	▲				▲		▲	▲	▲	▲			▲	
MIL M 5166C	Guided Missiles & Pilotless Aircraft Assembly, Servicing & Organizational Maintenance Instructions	3/75	T					▲	▲						▲		▲	△				
MIL M 5288F	Cargo Aircraft Loading & Offloading	4/73	T	◆	●	●	●	▲					△	▲			▲	▲		▲		
MIL M 5474A	Handbooks and Breakdowns	9/50	T		⊕	●	⊕	@	@	@	@	@	@	⊕	⊕		⊕					3.32
MIL-M-005474D	General Preparation of Technical Manuals	1/62	T				⊕	@	@	@	@	@	@	⊕	⊕		⊕		⊕			6.32
MIL D 5480E	Eng'g & Technical Data Reproduction Req'ts	6/70	•	◆	●	●	●	@	@	@	@	@	@	@	@		▲		△	▲		32
MIL M 5920C	Basic Weight Checklist & Loading Data	11/75	T	◇	○			▲						△			▲	△			C	
MIL M 6675A	Aircraft Power Package Build Up Instructions	10/68	T		○			▲							▲		▲	△			△	
MIL M 7298C	Commercial Equipment	4/75	T	◆	●	●	●			△		△	△	△	△		△	▲	△	▲		
MIL-N 7384C	Contractor Furnished Equipment (CFE) & Contractor Furnished Aeronautical Equipment (CFAE) Notices	4/77	T	◇	○					△		△	△		△					△		
MIL T 7578	Time Compliance Technical Orders (TCTO)	?	?		⊕			⊕									⊕					9.3.32
MIL-M-007700B	**Flight Manual**	8/74	T		⊕			⊕						⊕								2.9
MIL M 7700C	Flight Manual	4/78	T	◇	○			▲						▲			▲	▲	▲	▲	C	2.8
MIL-D 7822	Piloted Aircraft Standard Aircraft Characteristics & Performance Chart Drawings	11/51	•		●		●															32.9
MIL L 7976B	Contractor Furnished Equipment (CFE) & Accessories Data List & Card	11/71	T				○															9
MIL L-8031D	List of Applicable Publications (LOAPS)	6/75	T	◇				@	@	@	@	@	@	△	△		▲	▲				
MIL T 8074B	Training Devices Inspection	11/59	T		○								▲		▲		▲	▲	▲			
MIL P 8582	Aeronautical TMs Printing & Binding	12/61	T				●	⊕				●	●	●		⊕						3.32
MIL-D 8635	Interior Surface Decals	?	?				⊕															3.32.9
MIL D 8634	Exterior Surface Decals	?	?				⊕															3.32.9
MIL D-8706B	Aircraft Design Data Contract Requirements	8/68	•			●	●															32.9
MIL F 8785B	Piloted Airplane Flying Qualities	9/74	•		●	●	●	△														32.9
MIL A-8871A	Airplane Strength & Rigidity Flight & Ground Operations Tests	7/71	•		○			△														32.9
MIL M 8910	Illustrated Parts Breakdown	1/69	T	⊕	⊕	⊕	⊕	@	@	@	@	@	@		●		⊕					11.12 32
MIL M-008910A	**Illustrated Parts Breakdown**	4/72	T				○	△	△				△		▲		▲	▲			▲	8.11
MIL C 9851B	Nonreparable Equipment Checkout & Servicing Sheet	5/74	T		○			△	△	△		△	△		▲		▲	△			?	
MIL M 9854B	Aircraft Structural Repair	9/77	T	◆	●	●	●	▲							▲		▲	▲		△		
MIL Q 9858A	Quality Program Requirements	12/63	•	◆	●	●	●	△	△	△	△	△	△						△	△		32
MIL M 9864B	Organizational Maintenance	2/74	?		⊕										⊕							4.9
MIL M 9868D	35mm Microfilming of Engineering Documents	10/70	•	◆	●	●	●	@	@	@	@	@	@	@	@		▲		▲	▲		32
MIL M 9868/1A	35mm Microfilming of Engineering Documents for Naval Ship Systems	3/73	•				✩				★			@	@		▲		▲			8.32
MIL C 9883B	Missile & Space Systems Organizational Maintenance Checklists	8/69	T		○				▲				▲		▲		△	▲			C	
MIL T 9885	Time Compliance Technical Orders (TCTO)	?	?		⊕				●								●					9.3.32

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REQUIREMENTS AND GUIDELINES DOCUMENTS

NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	[illegible]	SERVICE APPLICABILITY: [illegible]	USAF	ARMY	NAVY	EQUIPMENT: AIRCRAFT	MISSILE SPACE	GRND EQUIPMENT	SHIPS	GRND VEHICLES	OTHER & SUPPORT	MANUAL TYPE: OPERATION	MAINTENANCE	REQUIREMENTS: PREPARER: ANALYSIS	STYLE FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	PERFORMANCE OPTIONS	REFERENCE NOTES
MILITARY SPECIFICATIONS (MIL x) *(Continued)*																						
MIL M 9891A	Missile & Space System Components & Related Equipment Intermediate & Depot Overhaul Instructions	7/75	T						▲				▲		▲		▲	▲			△	
MIL M 9901A	Programmed Test Equipment Manuals Tapes & Cards	11/69	T										▲		▲		△	▲		△		21
MIL M 9910A	Airborne Quick Reaction Capability (QRC) Equipment Operation & Maintenance Instructions with Parts Breakdown	2/74	T										▲	▲?	▲		▲	△				
MIL M 9913A	Parachute Inspection Repair & Packing Instructions	7/68	T										▲					▲			?	9
MIL C 9927A	Aeronautical Weapons Systems Organizational Maintenance Checklists	9/77	T					▲	▲	▲			▲		▲		△	△			C	
MIL M 9977F	Tactical Aircraft Nuclear & Non Nuclear Munitions Loading Procedures & Checklists	4/77	T					△					▲	▲			▲	▲			C	
MIL M 9994B	Mobile Training Sets & Part Task Trainers Operation and Maintenance Instructions	11/74	T		●	●							▲	△			△	▲	△			
MIL P 15024D	Electrical, Electronics & Mechanical Equipment Identification Plates	5/71	●		●	●	●															32,9
MIL M 15071G	Equipments & Systems Manuals Content Requirements	11/73	T							▲	▲		▲	▲	▲	△	▲	▲	▲	▲	▲	
MIL S 15822B	Supply Data & Instruction Sheets	1/59	T																			9
MIL L 17192C	Electronic Equipment Lubrication Design Lubricants & Information	3/57	●																			32,9
MIL C 17581	Ship or Shore Electronic Equipment Operating Instruction Chart	12/53	T							△	△		△	▲			△	△				
MIL F 17655C	Field Changes & Field Change Kits	2/69	T																			9
MIL N 17792A	Reproduction Negatives	2/56	?				⊕	(a)	(a)	(a)	(a)	(a)	(a)	⊕	⊕	⊕						3,32
MIL D 19890	Item Identification Descriptive Plan	?	T				⊕															3,9
MIL M 20800	Nuclear Weapons	4/74	?		⊕																	3,32,9
MIL M 21548B	FBM Weapon System	12/67	T																			9
MIL P 21630A	Stock List & Technical Publication Illustrations	9/65	●				⊕	(a)	(a)	(a)	(a)	(a)	(a)	⊕	⊕		⊕		⊕	⊕		3,32
MIL S 21740	*Performance Standards Technical Data Sheets*	9/69	T																			9
MIL B 21741C	Maintenance Standards Book	6/65	T							▲	△		△		▲		▲	▲	△	△		
MIL M 21742A	Electronic & Interior Communication Equipment Overhaul	2/71	T							▲	△				▲		▲	▲	▲	▲		
MIL M 21861	Materials Handling Equipment	7/65	T										▲		▲		▲	▲	△	▲		
MIL M 22202C	Aircraft Cross Servicing Guides	7/77	T		●	●	●	▲							▲		▲	▲	△			
MIL P 22203	Piloted Aircraft Standard Aircraft Characteristics Charts Performance Data Reports	9/59	T			●	●	▲						△		▲	△	▲				31
MIL T 22689	Production of Technical Manuals	1/62	T				⊕	(a)	(a)	(a)	(a)	(a)	(a)	⊕	⊕		⊕		⊕	⊕		3,9,32
MIL L 22690	Preparation & Production of Lubrication Charts, Plates & Manuals	7/67	T					(a)	(a)	(a)	(a)	(a)	(a)		▲		▲	▲		▲		8
MIL B 22907	Catapult, Arresting Gear, & Catapult Deck Gear & Accessories Services Bulletin	2/64	T																			9
MIL C 22908	Catapult, Arresting Gear, Visual Landing Aids, & Catapult Deck Gear & Accessories Service Changes	2/64	T																			9
MIL M 23305	Aircraft Launching & Recovery Equipment Operation Maintenance, & Overhaul Instructions with Illustrated Parts Breakdown	7/75	T					△					▲									9
MIL T 23382	Weapon Systems Safety	6/62	T																			9
MIL T 23383	Existing Weapon Systems Safety Supplement	6/62	T																			9
MIL T 23384	Missile Complete Round Safety	6/62	T																			9
MIL T 23385	Existing Missile Complete Round Safety Supplement	7/62	T																			9
MIL T 23386	Existing Missile Components Safety Supplement	6/62	T																			9
MIL M 23618E	Periodic Maintenance	11/75	T					▲	▲				▲		▲		▲	▲	△	△	▲	
MIL M 23782B	Aircraft Work Unit Code	1/69	T					▲							△		△	▲				
MIL M 24100B	Equipment & Systems Functionally Oriented Maintenance Manuals (FOMM)	1/74	T	△		●	●			▲	▲		▲	▲	▲		▲	▲	▲	▲	▲	
MIL T 24255A	Submarines Technical Repair Standards	4/69	T																			9
MIL O 24312A	Operational Stations Book (OSB)	6/69	T																			9
MIL R 24358	Shipboard Electronic Equipment Restoration Cognizance	11/68	●																			9
MIL M 24365A	Maintenance Engineering Analysis & Procedures & Formats for Associated Documentation	7/70	●							△	△					△						32,9
MIL T 24424	Maintenance, Overhaul & Repair Standards	8/70	T																			9
MIL M 24570	Combat System Technical Operations	6/78	T								▲		▲	▲	▲	△	▲	▲	▲	▲	△	31

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REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS						
																PREPARER						
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	REFERENCE NOTES
MILITARY SPECIFICATIONS (MIL x) *(Continued)*																						
MIL-M-25095A	Avionics Equipment & Systems Intermediate Maintenance Instructions	1/71	T		○			▲		▲			▲		▲		▲	▲				
MIL-W-25140B	Aircraft & Rotorcraft Weight & Balance Control System	10/77	•	◇	●	●	●	▲						△		▲	▲	▲		▲	△	32
MIL-M-25393A	Airborne Equipment Intermediate Maintenance Instructions	2/75	T		○			△	△				▲		▲		△	▲				
MIL-M-25394A	Engines Overhaul & Intermediate Maintenance Instructions	10/71	T		○			▲	▲				▲		▲	△	△	▲		▲		35
MIL-T-25802F	Nuclear Weapon Cargo Loading & Transport in Cargo Aircraft	2/75	T		○			▲					▲	▲			▲	△		▲		
MIL-C-25816	Special Weapon Delivery and Loading	?	?		⊕																	32;3;9
MIL-T-25832G	Air To Air Nuclear Weapon Delivery Aircrew Manual	4/70	T		○			▲	▲					▲			▲	▲	▲	△		
MIL-T-25848B	Strategic Bomber Aircraft Air-To Ground Missile/Special Weapon Delivery Aircrew Manual	4/75	T		○			▲	▲					▲			▲	▲	▲			
MIL-M-26788C	Automotive Equipment Operation & Maintenance	2/74	T		○							▲	▲	▲	⊕		△	△				5,9
MIL-T-27018E	Air Defense Fighter-Interceptor Aircraft Weapon Loading Procedures	3/68	T		○			▲	▲					▲			▲	▲	▲		C	
MIL-M-27026E	Strategic Bomber Aircraft Nuclear Weapon Level Delivery Manual & Checklist	10/70	T		○			▲					▲	▲			▲	▲	▲			
MIL-C-27278B	Flight Crew Checklist	7/76	T		○			▲						▲			▲	▲		▲	C	
MIL-M-27579D	Tactical Aircraft Multimode Nuclear Weapon (Bomb) Delivery Aircrew Manual	2/77	T		○			▲					▲	▲			△	▲	△		C	
MIL-M-27586C	Strategic Bomber Aircraft Nuclear Munitions Loading Procedures & Checklists	10/70	T		○			▲					▲	▲			△	△	△	△		
MIL-T-27594A	Missile/Warhead Mating, Assembly, Test, & Storage Procedures & Checklists	3/68	T		○				▲						▲		▲	△	△		△	
MIL-M-28759	Maintenance Req'ts Cards (MRCs) & Maintenance Index Pages (MIPs)	2/71	?				⊕			⊕												3,9,32
MIL-I-28947A	Technical Repair Parts Publications Illustrations	11/70	T				○															9
MIL-P-28999	Instruction-Type Technical Publications	8/73	T				○															9
MIL-P-29005A	Training Devices Planned Maintenance System	5/78	T				○															9
MIL-G-29011	Training Aids Operation & Maintenance Guides	2/77	T				○															9
MIL-D-29173	Civil Engineering Equipment Technical Documentation	7/77	T	◇			○															9
MIL-M-29355	Various Types of Equipment Operation & Maintenance	6/77	T				○															9
MIL-M-38311A	Intercontinental Ballistic Missile (ICBM) Operation Manual & Associated Checklist	6/74	T	◇	○				▲					▲				▲	▲		C	
MIL-M-38312A	Real Property Installed Equipment (RPIE) Equipment Manuals	4/74	T	◇	○								▲	▲	▲		△	△				
MIL-M-38313A	Real Property Installed Equipment (RPIE) System Manuals	4/74	T	◇	○								▲	▲	▲		▲	△				
MIL-M-38384A	Tactical Fighter & Tactical Bomber Non Nuclear Munitions Delivery	4/69	T		○			▲	△					▲			△	▲		△		
MIL-M-38413B	Air Refueling Procedures & Aircrew Checklist	5/78	T	◇	○			▲						▲			▲	▲		△		
MIL-M-38701A	Missile & Space Weapon Systems Inspection Req'ts & Work Cards	8/78	T		○				▲	▲			▲				▲	△	▲		△	8,22
MIL-M-38716A	Strategic Aircraft Non-Nuclear Munitions Loading Procedures & Checklists	5/73	T		○			△					▲	▲			△	▲		▲	C	
MIL-M-38717B	Ground Communications-Electronics-Meteorological (CEM) Equipment Work Unit Codes	1/76	T	◇	○					▲					▲		▲	▲		△		
MIL-C-38720A	Airborne Armament & Electronic Systems/Equivalent Bench Check & Intermediate Maintenance Checklist	5/70	T		○			▲		△			△		▲		△	△			C	
MIL-M-38730	General Preparation Requirements	4/65	?		⊕																	6,9,32
MIL-M-38733B	Hand Held Flight Computers Operation Instructions	5/72	T		○			△						▲			▲	△				
MIL-M-38748A	Microfiche for Engineering/Technical Data, Reports, Studies, & Related Data	5/77	•	◆	●	●	●	△		△	△		△									9,32
MIL-M-38768A	Surface Launched Missile & Spacecraft Systems Work Unit Codes	8/75	T	◇	○				▲						▲	△	▲	▲	△	▲		
MIL-M-38769B	Aircraft & Drones Work Unit Codes	1/76	T	◇	○			▲							▲	△	▲	▲	△	▲		
MIL-M-38777A	Ground Communication-Electronics-Meteorological (CEM) & Related Equipment Inspection & Lubrication Req'ts & Workcards	8/71	T		○					▲					▲		△	▲		▲		

REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS						
																PREPARER						
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	TPA FORMAT OPTIONS	REFERENCE NOTES
MILITARY SPECIFICATIONS (MIL x) *(Continued)*																						
MIL C 38778A	Checklist, Title Page, List of Effective Pages, Printing & Binders	5/78	T					△	△				△	△	△		▲	△			C	
MIL M 38780A	Nondestructive Inspection	4/73	T					▲	▲						▲		△	▲	▲			
MIL M 38781D	Non Nuclear & Chemical Munitions/Biological Research Agents Storage & Maintenance Procedures, Checklists, & Source Data	4/77	T										▲		▲		▲	▲	△	▲	C	
MIL C 38782	Special Weapon Bombs, Warheads, & Related Equipment Operational Readiness & Serviceable Condition Checklists	11/67	T						△				△		△		△				C	
MIL M 38783A	Air Launched Missiles Work Unit Codes	4/75	T						▲				△		▲	△	▲	▲	△	▲		
MIL M 38784A	General Style & Format	7/78	T		●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	△	△		▲		▲	▲		6,8
MIL M 38786A	Training Equipment Work Unit Codes	3/75	T										▲		▲	△	▲	▲	△	▲		
MIL M 38787	Missile Motors Transportation, Handling, Inspection Operations, Firing, Post Firing & Dissection	2/74	T						▲					△	△		△	▲				
MIL M 38788A	Common & Peculiar Aerospace Ground Equipment (AGE) Work Unit Codes	4/75	T										▲		▲	△	▲	▲	△	▲		
MIL M 38789A	Various Equipment & Accessories Overhaul Instructions W/Wo Illustrated Parts Breakdown	1/73	T	◆	●		●					⊕	▲		▲		△	▲				5
MIL P 38790	Technical Manual Photolithographic Negatives, Reproduction Assembly Sheets, Printing, & Production	9/77	T	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	△	△		▲		△	▲		
MIL M 38791A	Ground Communication Electronic Meteorological (CEM) Equipment Engineering Installation Facility Standards	6/77	T							▲					▲		△	▲				
MIL M 38792A	Aircraft Weapon Systems Non Nuclear Explosive Ordnance Disposal	8/74	?		⊕	⊕																36,32,9
MIL M 38793	Test & Measurement Equipment Calibration Procedures	5/69	T	◆	●	●	●						▲		▲		▲	▲		△		42
MIL M 38793/1A	Calibration Procedures Manual Submission	12/71	T				☆															
MIL S 38794A	Non Nuclear Munitions Basic Information, Loading Procedures, Disposal Procedures, Fire Fighting, & Related Criteria Source Data	9/77	T										▲	▲			△	▲				9
MIL M 38795A	System Peculiar Equipment Corrosion Control	4/73	T					▲	▲				▲		▲		▲	▲				
MIL M 38796A	Non Nuclear Munitions Shipping & Storage Container Organizational & Intermediate Maintenance, & Depot Overhaul Instructions with Illustrated Parts Breakdown	8/77	T										▲		▲	△	▲	△	△			
MIL M 38797	Various Equipment Operation & Maintenance Instructions	10/76	T										▲	▲	▲		▲	▲		△	△	18
MIL M 38798B	Ground Communication Electronics Meteorology (CEM) Equipment, Sites, System, & Facilities Circuit Diagrams, Alignment Procedures, Operation & Maintenance Instructions, & Installation Planning	12/75	T							▲			△	▲	▲		▲	▲		▲	△	19
MIL M 38799	Aircraft, Missile/Space, Ground Communication Electronics Meteorology (CEM) & Related Equipment, Sites, Systems & Facilities Schematic Block Diagrams (SBD) & Maintenance Dependency Charts (MDC)	8/71	T					▲	▲	▲			▲		▲		▲	▲			▲	
MIL M 38800A	Aircraft, Missiles, & Non Munition Accessories Organizational Maintenance Instructions	10/76	T					▲	▲				△		▲		▲	▲		▲	△	4
MIL M 38801	Aircraft Emergency Rescue & Fire Protection Information	12/72	T					▲						▲			▲	▲		△	▲	34
MIL M 38802	Microfilming (?)	?	?		⊕																	39,32
MIL T 38804	Time Compliance Technical Orders (TCTO)	8/78	T																			9
MIL M 38805	Non Nuclear & Special Munitions Work Unit Codes	9/73	T										▲		△		▲	▲	▲	▲		
MIL M 38807	Illustrated Parts Breakdown (IPB)	9/77	T					▲	▲	▲			▲		▲		▲	▲		▲	▲	12
MIL M 38811	Methods & Procedures Technical Orders (MPTO)	11/73	T					(a)	(a)	(a)	(a)	(a)	(a)		△		▲					
MIL M 38812	Automotive Equipment Maintenance & Overhaul Instructions w/wo Illustrated Parts Breakdown (IPB)	4/74	T									▲	▲		▲		▲	△			△	5
MIL M 38813	Aircraft & Missile System Peculiar Equipment Storage	3/74	T					▲	▲						▲		△	△				
MIL H 46855A	Military Systems, Equipment & Facilities Human Engineering	7/78	●		●	●	●															32,9
MIL M 63000C	General Requirements for Manuscripts	9/71	T			⊕		(a)	(a)	(a)	(a)	(a)	(a)	⊕	⊕		⊕	⊕	⊕			3
MIL M 63001E	Repair Parts & Special Tool List	12/75	T					△		△		△	△									9
MIL M 63002D	Modification Work Orders	11/77	T																			9
MIL M 63004B	Lubrication Orders	5/76	T									△										9
MIL M 63005	Army Aircraft Shipment Preparation	6/78	T			●						▲										9
MIL M 63006B	Equipment Serviceability Criteria (ESC)	9/71	T																			9
MIL M 63009C	Noncombat Automotive, Mechanical & Construction Equipment, & Power Tools	6/76	T																			9
MIL M 63010	DOD Standard Generator Sets	1/76	T		●	●	●						▲	▲	▲		▲	▲	▲	▲		
MIL M 63011A	Army Aircraft Maintenance Test Flight	4/78	T																			9
MIL D 63012	Conventional & Chemical Ammunition Maintenance /Demilitarization Depot Maintenance Work Reqts	11/75	T																			9

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																PREPARER						
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE SPACE	C-E EQUIPMENT	SHIPS	GROUND VEHICLES	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	PA FORMAT OPTIONS	REFERENCE NOTES
MILITARY SPECIFICATIONS (MIL x) *(Continued)*																						
MIL C-63013A	Sets, Kits & Outfits Components Lists Supply Catalog	10/75	T	◇		○																9
MIL M 63015	Conventional & Chemical Ammunition	11/75	T			○																9
MIL M 63016	Munitions Equipment	11/75	T			○							▲									9
MIL M 63017	Munition Equipment & Ammunition Data Sheet	4/76	T	◇		○																9
MIL M 63018A	Non-Nuclear Explosive Ordnance Disposal	12/76	T	◇	●	●	●	△					▲	▲			▲	▲				36
MIL-M-63019	Telecommunications Equipment (Except Teletypewriter)	6/76	T			○				▲												9
MIL M-63020A	Radar Equipment	8/76	T	◇		○				▲												9
MIL-M-63021	Teletypewriter Equipment	11/75	T			○																9
MIL M-63022	Aircraft Electronic Configurations	11/75	T			○		△		▲												9
MIL-M 63023	Military Material Transportability Guidance	5/75	T			○																9
MIL M-63024	Photographic, Motion Picture, Sound, & Recording Equipment	11/75	T			○							▲									9
MIL M-63025	Electronic Test Equipment	11/75	T			○							▲									9
MIL-M-63026A	Army Aircraft Maintenance	12/75	T	◇		○		▲														9
MIL-M-63027	Aeronautical Accessories & Support Equipment Maintenance & Overhaul	7/71	T			○		△					▲									9
MIL M-63028	Aircraft Engines & Engine Accessories Maintenance	9/69	T			○		▲														9
MIL-M-63029A	Aircraft Operator's & Crewmember's Checklist	4/74	T	◇		○																9
MIL-M-63030B	Aircraft & Related Systems Preventive Maintenance	5/73	T			○		▲		△			△		▲		△	▲		△		
MIL M-63032B	Weapons, Combat Vehicles, & Fire Control Materiel	6/76	T	◇		○						▲	▲	▲	▲		▲	▲	▲	▲		
MIL M-63033	*Surplus Military Items Demilitarization*	10/73	T			○																9
MIL M-63035	Front End Analysis	3/78	T	◇		○		(a)	(a)	(a)	(a)	(a)	(a)	▲	▲	▲			△	▲		48
MIL-M-63036	Equipment Operator's Manual (Except Aircraft)	5/76	T	◇		○			▲	▲		▲	▲	▲			▲	△	▲	▲	△	20;48
MIL M-63037	Organizational, Direct Support, & General Support *Maintenance (ITDT Flow Chart)*	5/77	T	◇		○		▲	▲	▲		▲	▲		▲	△	▲	▲	▲	▲	▲	42 43 48
MIL-M-63038A	Organizational or Aviation Unit, Direct Support or Aviation Intermediate, & General Support Maintenance	3/78	T	◇		○		▲	▲	▲		▲	▲		▲	△	▲	▲	▲	▲	△	7 48
MIL M-63040	Extension Training Materials for Integrated Technical Documentation & Training (ITDT)	5/77	T	◇		○		(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)		▲	▲	▲	▲	△	48
MIL-M-63041B	Depot Maintenance Work Requirements	8/76	T	◇		○		(a)	(a)	(a)	(a)	(a)	(a)		▲		▲	▲	▲	▲		
MIL-M-63042B	Equipment Destruction to Prevent Enemy Use	7/75	T			○																9
MIL M-63043	Missile System Equipment Check Procedures	5/70	T			○			▲													9
MIL M-63044	Missile System Equipment Unit Under Test (UUT) Procedures	3/76	T			○			▲						▲		▲	▲			△	
MIL-M-63046A	Missile System Equipment	10/77	T	◇		○			▲					▲	▲		▲	▲	▲	▲		
MIL P 63048A	Equipment Publications on Microfiche	9/74	T			○							▲									9
MIL M 63049	*List of Applicable Publications (LOAP)*	7/71	T			○																9
MIL M-63050	End Item Components, Basic Issue Items, Additional Authorization, & Expendable Supplies & Materials Lists	5/76	T			○				△		△	△									9
MIL M 630XX	(Draft) Weapons, Combat Vehicles, Trucks, Generator Sets, Construction & Mat'l Handling Equipment, Radios, Test & Diagnostic Equip & Audio Visual Equipment 'New Look' Operator Manuals	4/74	T			□						■	■	■	■		■	■		■	■	40 48
MIL-M 632XX 1	(Draft) Improved Technical Documentation & Training Job Performance Manuals & Job Performance Guides	12/75	T			□		■	■	■		■	■	■	■	■	■	■	■	□	■	40 48
MIL M 632XX 2	(Draft) Improved Technical Documentation & Training Training Materials Supporting Job Perf. Manuals & Job Perf. Guides	12/75	T			□		■	■	■		■	■		■	□	■		■	□		40 48
MIL L 81043	Air Weapon Systems Lubrication Charts	5/64	T		●		●															9
MIL M 81203A	In Process Reviews, Validation & Verification Support	12/67	T				☆	△					△	△	▲				▲	▲		
MIL M-81218	Aircraft Engine Intermediate & Depot Maintenance	2/65	T				☆															9
MIL C 81222C	*Flight Crew Checklists*	2/78	T				☆	▲						▲			▲	▲			C	8
MIL M-81260A	Aircraft/System/Equipment Maintenance	10/71	T				☆	▲					▲		▲	△	△	▲		△	△	8
MIL M 81273A	Technical Manuals General Specification	4/66	T				☆															9
MIL M 81273/1A	Equipment Assembly & Test	4/66	T				☆															9
MIL M 81273/2A	Equipment User's Manual	4/66	T				☆															9
MIL M 81273/3A	Reference Type Encyclopedia	4/66	T				☆															9
MIL M 81273/4A	Weapon System Manual	4/66	T				☆															9
MIL M 81273/5A	Equipment Maintenance Manual	4/66	T				☆															9
MIL M 81273/6A	Electronic & Electromechanical Equipment Use Guides	4/66	T				☆															9

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NUMBER AND REVISION	SUBJECT	LATEST UPDATE	DSC?	SERVICE APPLICABILITY: ?	AF	ARMY	NAVY	EQUIPMENT: AIRCRAFT	MISSILE/SPACE	GSE/EQUIPMENT	SHIP	ELECTRONICS?	TRNG & SUPPORT?	MANUAL TYPE: OPERATION	MAINTENANCE	REQUIREMENTS – PREPARER: ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	IPA FORMAT OPTIONS	REFERENCE NOTES
MILITARY SPECIFICATIONS (MIL x) *(Continued)*																						
MIL M 81273/2A	General Purpose Reference Type Manuals	4/66	T																			9
MIL M 81310B	Airborne Conventional & Nuclear Weapons/Stores Loading	5/72	T																			9
MIL A 81573	Aircrew Escape System Descriptive & Performance Data Presentation	4/68	•					▲						▲				▲		▲		12
MIL M 81700	Airborne Armament Equipment	9/68	T										▲									9
MIL M 81701B	Airborne Missiles & Guided Weapons Microform Compatible Manuals	?/76	T						▲													9
MIL M 81702A	Airborne Conventional Weapons	7/72	T					△					▲									9
MIL M 81715	Ship Weapon Installations	2/69	T																			9
MIL M 81748B	Rapid Action Changes	?/78	T					▲					▲	▲	▲	△	▲		△			8,26
MIL M 81754	Aircraft/Missile Technical Manual Lists	2/70	T																			9
MIL M 81792	Nuclear Weapons Loading & Transport in Cargo Aircraft	9/70	T																			9
MIL M 81798	Complete Engine Repair Req'ts Cards & Sequence Control Charts	10/70	T																			9
MIL C 81810	Airborne Missile & Guided Weapon Assembly Checklist	1/71	T																			9
MIL M 81834	Tactical Aircraft	8/71	T																			9
MIL M 81901	Aircraft Fire Fighting & Rescue Information	4/72	T																			9
MIL M 81919	Support Equipment Microform Compatible Operation Maintenance & Calibration Manuals	7/73	T										▲	△	△	▲	▲	▲	△	△	△	
MIL M 81927	Microform Compatible Technical Manuals	2/75	T					△	△	△		△	△	△	▲		▲		△	▲	▲	23
MIL M 81928	Aircraft, Equipment, & Component Microform Compatible Maintenance Manuals	2/75	T					▲					▲		▲			▲	△		△	24
MIL M 81929	Microform Compatible Illustrated Parts Breakdown (IPB)	2/75	T					(a)	(a)	(a)	(a)	(a)	(a)	△	▲		▲	▲			△	25
MIL M 81930A	16mm Silver Halide Microfilm Masters	7/77	T					△					△									9
MIL M 81931	16 mm Duplicate Microfilm Cartridge Loading & Labeling, Packing & Shipping	2/74	T																			9
MIL D 81992	Technical Directives	1/77	T																			9
MIL M 82376A	Training Devices Operation & Maintenance Instructions	9/77	T		●	●	●															9
MIL M 82527A	Maintenance Req'ts Cards (MRC) & Maintenance Index Pages (MIP)	8/69	?				(a)		(a)	(a)		(a)			(a)	(a)	(a)	(a)	(a)	(a)	(a)	3,32
MIL M 82588A	Fire Control Switchboard	9/71	T																			9
MIL M 83127A	Sensor Exploitation	5/69	T	◆	●		●							▲			▲	▲		▲		
MIL J 83302	VNAF Organizational Maintenance Advanced Type Job Performance Aids	12/70	T		(a)			(a)							(a)	(a)	(a)	(a)	(a)		(a)	3,32
MIL M 83493	Remotely Piloted Vehicles (RPV) Organizational (Flight Line) Maintenance	10/77	T					▲							▲		▲	▲		▲	△	
MIL M 83495	Aircraft, Missiles & Space Vehicles Organizational Maintenance	6/77	T					▲	▲						▲		▲	▲		▲	▲	
MIL M 83496	Avionics Systems Organizational Maintenance Instruction & Condensed Maintenance Guide (CMG)	11/75	T					▲							▲		▲	△			△	
MIL M 83498	Aircraft Power Package (Quick Engine Change Configuration) Testing	11/75	T					▲							▲		△	▲				
MIL M 83499	Flight Manual Safety & Operational Supplements, Title Page, & List of Effective Pages	7/77	T					▲					▲	▲			▲	△				16
MIL B 83931	Flexible Binders	6/68	•					(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)		▲		▲	△		17,32
MIL M 85025	NATOPS Flight Manual	7/75	T					▲						▲			▲	▲	△	▲		10
MIL M 85120	Automated Systems Input Source Data	3/78	T																			9
MIL M 87929	Engines Intermediate & Depot Maintenance Work Package Format	5/78	T					▲	▲						▲		▲	▲		▲		
MILITARY STANDARDS (MIL STD)																						
MIL STD 12C	Abbreviations in Drawings, Specifications, Standards & Technical Documents	6/68	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)		△	▲				32
MIL STD 15 1	Electrical & Electronic Diagrams Graphics Symbols	?	?				(a)															32,3,9
MIL STD 15 3	Architectural & Electrical Wiring Symbols	?	?		(a)																	32,3,9
MIL STD 16	Electrical & Electronic Symbol Reference Designations	?	?																			32,9
MIL STD 17B 1	Non Aeronautical, Aerospacecraft, Spacecraft Mechanical Symbols	9/77	•	◆	●	●	●			▲	▲	▲	▲	(a)	(a)			▲			△	32
MIL STD 17B 2	Aeronautical, Aerospacecraft, & Spacecraft Mechanical Symbols	2/65	•	◆	●	●	●	▲	▲					(a)	(a)			▲			△	32
MIL STD 18B	Structural Symbols	6/73	•		●	●	●															32,9
MIL STD 33	Lubrication Instructions	11/60	•																			32,9
MIL STD 100B	Engineering Drawing Practices	4/76	•		●	●	●															9
MIL STD 109B	Quality Assurance Terms & Definitions	4/69	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)				▲			

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NUMBER AND REVISION	SUBJECT	LATEST UPDATE	ST	SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS						REFERENCE NOTES
				[illegible]	[illegible]	ARMY	[illegible]	AIRCRAFT	MISSILE SPACE	[illegible] EQUIPMENT	[illegible]	[illegible]	[illegible]	OPERATION	MAINTENANCE	PREPARER: ANALYSIS	PREPARER: STYLE FORMAT	PREPARER: CONTENT	PREPARER: QUALITY ASSUR	ACQUISITION	DATA FORMAT OPTIONS	
MILITARY STANDARDS (MIL STD) (continued)																						
MIL STD 122	Aeronautical Aerospacecraft & Spacecraft Mechanical Symbols	?	•		(a)																	32,3,9
MIL STD 129H	Marking for Shipment and Storage	1/78	•	●	●	●	●															32,9
MIL STD 143B	Order of Precedence for Selection of Standards and Specifications	11/69	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	△				△		
MIL STD 196C	Joint Electronics Type Designation System	11/75	•		●	●	●															32,9
MIL STD 290C	Petroleum & Related Products Packaging, Packing & Marking	5/77	•		●	●	●															32,9
MIL STD 411D	Aircrew Station Signals	8/74	•	◆	●	●	●	▲						▲		▲						32
MIL STD 415D	Electronics System & Equipment Test Points & Test Facilities	10/71	•		●	●	●															32,9
MIL STD 444	Ammunitions Nomenclature & Definitions	7/64	•	◆	●	●	●															32,9
MIL STD 470	Systems & Equipments Maintainability Program	3/66	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)		▲	▲						
MIL STD 471A	Maintainability Demonstration, Evaluation, Verification	1/75	•	△	●	●	●															9
MIL STD 499A	Engineering Management	5/74	•													△				△		32
MIL STD 681B	Hook Up & Lead Wire Identification Coding & Application	2/67	•		●	●	●															32,9
MIL STD 709C	Ammunition Color Coding	5/76	•		●	●	●															32,9
MIL STD 721B	Reliability, Maintainability, Human Factors & Safety Effectiveness Terms	3/[illegible]	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	△				△		
MIL STD 731C	Auxiliary & Miscellaneous Small Ships Damage Control Books	6/72	T								▲			△			▲	▲	△			
MIL STD 722C	Warships & Miscellaneous Large Ships Damage Control Books	6/74	T								▲			△			▲	▲	△			
MIL STD 783B	Airborne Equipment & Aircrew Station Legends	10/69	•		●	●	●	△														32,9
MIL STD 784B	Surface Ships Damage Control Books Revisions	6/74	T								▲			△			△	△	△			
MIL STD 791.1	Hall Effect Device Definition, Letter Symbol, Color Code & Circuit Symbol	?	T		(a)		(a)															3,9,32
MIL STD 797B	Submarines Damage Control Books	7/73	T																			9
MIL STD 838B	Military Equipment Lubrication	8/69	•		●	●	●															32,9
MIL STD 863A	Wiring Data & System Schematic Diagrams	12/75	•	△				▲	▲						▲		▲	▲			▲	32
MIL STD 875A	Aeronautical & Support Equipment Type Designation	4/74	•		●		●															9
MIL STD 882A	System Safety Program Req'ts	6/77	•	△	●	●	●															32,9
MIL STD 1167B	Ammunition Data Card	10/68	•	◆	●	●	●						▲	(a)	(a)	△	▲	▲				32
MIL STD 1247B	Aircraft, Missile & Space System Hose, Pipe & Tube Line Marking Function & Hazard Identification	12/68	•		●	●	●	△	△													32,9
MIL STD 1309	Automatic Electronic Test & Checkout Terms Definitions	?	•			(a)																32,9
MIL STD 1388.1	Logistic Support Analysis (LSA)	4/78	•	△	●	●	●	△	△	△	△	△	△	▲	▲	▲						
MIL STD 1388.2	Logistic Support Analysis (LSA) Data Element Definitions	4/78	•	△	●	●	●	△	△	△	△	△	△	▲	▲	▲						
MIL STD 1552	Uniform DOD Req'ts for Provisioning Technical Documentation	11/74	•	◆	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	△				△		
MIL STD 1685	Comprehensibility Standards for Technical Manuals (METRICS)	10/78	•	△	●	●	●	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)		▲		▲		▲	
MIL STD 1752	Reading Level Requirements	9/78	T	△				(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	▲	△					

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NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	[illegible]	SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS PREPARER				ACQUISITION	IPA FORMAT OPTIONS	REFERENCE NOTES
				[illegible]	USAF	ARMY	NAVY	AIRCRAFT	MISSILE SPACE	CE EQUIPMENT	SHIP	[illegible]	[illegible]	OPERATION	MAINTENANCE	ANALYSIS	STYLE FORMAT	CONTENT	QUALITY ASSUR			
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DI M 2040A	Technical Manual Organization Plan (TMOP)	9/76	T																			32,9
DI M 2041	Technical Manual Outline Book Plan	6/72	T					a	a	a	a	a	a	a	a		△	△				
DI M 2042	Technical Manual Manuscript Copy	6/72	T					a	a	a	a	a	a	a	a		△					
DI M 2043A	Preliminary Technical Manuals	9/76	T					a	a	a	a	a	a	a	a		△	△				
DI M 2044A	Standard Technical Manuals	9/76	T					a	a	a	a	a	a	△	△		△					
DI M 2045A	Tech. Order CFAE/CFE Notices & Related Tech. Orders	4/72	?																			32,9
DI M 2046	Technical Manual Permanent Page Changes	6/72	T					a	a	a	a	a	a	a	a		△	△				
DI M 2047A	Technical Manual Update & Revision	9/76	T					a	a	a	a	a	a	a	a		△					
DI M 2048A	Technical Manual Complete Revision	9/76	T					a	a	a	a	a	a	a	a		△					
DI M 2049A	T[illegible]cal Manual Supplement	9/76	T					a	a	a	a	a	a	a	a		△					
DI M 2050	Manual with Supplementary Data, Technical, Comm. Equip	6/72	T																			32,9
DI M 2051A	Technical Manual Quality Assurance Data	9/76	T					a	a	a	a	a	a	a	a				△			
DI M 2052	Technical Manual Status Report	6/72	T					a	a	a	a	a	a	a	a				△	△		
DI L 3333	Decalomanias & Other Markings	12/72	?																			9
DI M 3401	Technical Order Publication Plan	2/70	?																			32,9
DI M 3402	Technical Order Status & Schedules	2/70	?																			32;9
DI M 3403	Explosive Ordnance Disposal Procedures	2/70	?																			9
DI M 3405A/H 105	Technical Order CFAE/CFE	?	?																			32;9
DI M 3406	Real Property Installed Equipment Manuals	11/71	T																			9
DI M 3407A/H 107 3	Technical Orders	5/71	?																			32,9
DIM 3408/H 108 1	Technical Order Validation Record	2/70	?																			32,9
DI M 3409	Information System Operator Positional Handbook	11/71	?																			9
DI M 3410	Computer Program User Manual	11/71	T																			9
DI M 3411/H 111 1	Computer Programming Manual	11/71	T																			9
DI M 3413/H 114	Tech. Order Publications for Development Programs	2/70	?																			32,9
DI S 3413/H 117	?(same as DI M 3413 H 114 1)	?	?																			32,9
DI M 3414	TO Data Research & Analysis Source Data	2/70	?																			9
DI M 3416	(Command Manual) (from AFAD 71 531 (31))	11/71	T																			9
DI S 3604	Functional Flow Diagrams	11/71	?																			32;9
DI M 4022C	Commercial Manuals	5/77	T																			9
DI M 5096	System User's Manual	10/67	T																			9
DI L 6138	Integrated Support Plan (ISP)	4/71	?																			32,9
DI M 6153	Technical Manuals Commercial Literature TCTO & Manuals	4/71	T		●	●	●															
DI M 6154	Technical Manual Plan	4/71	T		●	●	●															
DI M 6155	Technical Manual Status & Schedules	4/71	T		●	●	●															
DI M 6156	TM Contractor Furnished Equipment (CFE) Notices	4/71	T		●	●	●															
DI M 6157	Technical Publications for Advanced Development Programs	4/71	T		●	●	●	a	a	a	a	a	a	a	a							
DI M 6158	TM Data Research & Analysis Source Data	4/71	T		●	●	●	a	a	a	a	a	a	a	a							
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DI V 7007	Tools & Test Equipment List	11/74	?																			9
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[illegible] 113	[illegible] & [illegible] Markings (from AFAD 71 531 19 (B))	?	?																			9
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DOD D 1000B	Engineering Drawings & Associated Lists	10/77	•		●	●	●	a	a	a	a	a	a	a	a					▲		32
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DSM 4120 3M	(Specification Preparation)	?	•																			32,9
DSAM 8200 1	Procurement Quality Assurance	8/76	•	●	●	●	●	a	a	a	a	a	a	a					▲	▲		30,32
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DSAR 4151 9	Interservicing of Technical Manuals & Related Technology	12/76	T		●	●	●	a	a	a	a	a	a	a	a					▲		29
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DODISS	Department of Defense Index of Specifications & Standards	?	•					a	a	a	a	a	a	a	a							37
DODM 4120 3M	(Specification Amendments)	?	•																			32,9
DOD ISPR 5200 1 R	Information Security Program Regulation	?	•																			32,9
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AFAD 71-531 (4)	Aeronautical & Non Aeronautical Systems, Equipment & Accessories TO Data Req'ts	6-76	T																			27
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AFM 77-310, v II	Vehicle Maintenance Management	?	●																			
AFM 85-1	Resources & Work Force Management	?	●																			
AFM 86-2	Standard Facility Requirements	?	●																			
AFM 92-1	Fire Protection Program – Operational Procedures	?	●																			
AFM 100-18	Ground Communications Electronics Program Management, USAF	?	?																			32
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AFM 172-1	Budgeting, Funding and Cost Reporting (of TOs) (3 vol.)	?	●																			
AFM 300-4, v XI	Data Elements & Codes for v. IX (per another source) (microfiche)	12/78	?																			32
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AFR 60-9	Aircrew Flight Manuals Program	6/75	T					△						▲								32
AFR 66-14	Equipment Maintenance Policies, Objectives & Responsibilities	5/75	•					(a	(a	(a	(a	(a	(a		△	△				△		32
AFR 66-19	Interservicing of Technical Manuals & Related Technology	12/76	T	△	●	●	●	(a	(a	(a	(a	(a	(a	(a	(a					▲		29
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AFR 74-15	Procurement Quality Assurance	8/76	•	△	●	●	●	(a	(a	(a	(a	(a	(a	(a	(a				▲	▲		30,32
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AFR 80-14	Systems, Subsystems, & Equipment Test & Evaluation	?	•																			32, 9
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AFR 122-4	The Two-Man Concept (Nuclear Safety)	3/78	•																			32
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AFR 310-1	Management of Contractor Data	6/69	•					(a	(a	(a	(a	(a	(a	△	△					▲		32
AFR 400-41	? (RPIE)	?	?																			32
AFR 800-2	Acquisition Program Management	11/77	•																	▲		32
AFR 800-8	Integrated Logistics Support (ILS) Program for Systems & Equipment	7/72	•					(a	(a	(a	(a	(a	(a	(a	(a					△		32
AIR FORCE TECHNICAL ORDERS (TO)																						
TO-0-1-01	Numerical Index & Requirement Tables, Numerical Index, Alphabetical Indexes & Cross Reference Table TOs	12/78	T																			38
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TO-0-2-1	Alphabetical Listing of Equipment to Technical Publication Number Groups	?	?																			32;9
TO-00-5-1	The Air Force Technical Order System	12/79	T					△	△	△		△	△	△	△				▲	▲		
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AIR FORCE LOGISTICS COMMAND (AFLC)

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NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	
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AFLCM 66-2	Maintenance Engineering, Operations & Management	?	?																			32;9
AFLCM 66-14	AF Technical Order System Data Operations	9/77	T					(a	(a	(a	(a	(a	(a	△	△		△	△	▲	▲		
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AIR FORCE LOGISTICS COMMAND REGULATIONS (AFLCR)																						
AFLCR 310-1	Management of Contractor Data	10/71	•		○			(a	(a	(a	(a	(a	(a	(a	(a					▲		32
AFLCR 800-24	Standard Integrated Support Management System (SISMS)	5/77	•		●	●	●	(a	(a	(a	(a	(a	(a	(a	(a	▲			▲	▲		13, 32
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LOLMP	Exhibit – TO Reading Grade Level Requirements	?	T					(a	(a	(a	(a	(a	(a	(a	(a	▲	△					

AIR FORCE SYSTEMS COMMAND (AFSC)

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NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	[illegible]	[illegible]	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	COMM ELEC EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	PREPARER: ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR	ACQUISITION	JPA FORMAT OPTIONS	REFERENCE NOTES
AIR FORCE SYSTEMS COMMAND DESIGN HANDBOOKS (AFSC DH)																						
[illegible]	[illegible]	[illegible]	•												▲	▲			▲		▲	[illegible]
[illegible]	System Safety	[illegible]	•																			[illegible]
[illegible]	Maintainability	[illegible]	•												▲	▲						[illegible]
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[illegible]	Specifications & Standards		•																			[illegible] 9
[illegible]	Explosives Safety		•																			[illegible] 9
[illegible]	[illegible]																					[illegible]
AFSCM 310-2	[illegible]	[illegible]																		▲		
[illegible]	[illegible]		•																			[illegible] 9
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ASDM [illegible]	[illegible] & Management [illegible]	[illegible]	•																	▲		[illegible]

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ARMY REGULATIONS (AR)																						
AR 310-25	Dictionary of U.S. Army Terms	[illegible]																				32.9
AR 310-50	Authorized Abbreviations & Brevity Codes	[illegible]																				32.9
AR 310-70	[illegible] of Tech[illegible] & Related Technology	12-76	T	●	●	●	●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					▲		29
AR 611-201	[illegible] Career Mgt Fields & Military Occupational Specialties	[illegible]																				32.9
AR 702-4	Procurement Quality Assurance	8-76	•	●	●	●	●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				▲	▲		30
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[illegible]	[illegible]	[illegible]	•		●	●	●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	▲			▲	▲		13, 32
ARMY PUBLICATIONS, OTHER																						
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REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS						
																PREPARER						
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	REFERENCE NOTES
NAVAL OPERATIONS (OPNAV) INSTRUCTIONS																						
OPNAVINST 4790.2	NAVAIR Maintenance Program	12/75	•																			32,9
OPNAVINST 4790.4	Maintenance & Material Management	2/76	•																			32,9
NAVAL AIR SYSTEMS COMMAND (NAVAIR) PUBLICATIONS																						
NAVAIR 00-25-600	Support of In Process Review, Validation & Certification	7/69	T																△			9
NAVAIR 00-25-700	TM Preparation Guide for Tech Writers, Editors & Illustrators	6/76	T													▲	▲		▲		▲	
NAVAL MATERIAL COMMAND (NAVMAT)																						
NAVMATINST 4000.38	Standard Integrated Support Mgt. System (SISMS)	6/77	•		●	●	●									▲			▲	▲		13,32
NAVMATINST 4355.69A	Procurement Quality Assurance	8/76	•	●	●	●	●												▲	▲		30,32
NAVMATINST 4790.5	MIP & MRC Standardization	7/69	T																		?	9
NAVMATINST 5600.11A	Interservicing of TMs & Related Technology	12/76	T	●	●	●	●													▲		29
NAVAL SEA SYSTEMS COMMAND PUBLICATIONS																						
NAVSEA OP 1700	Standard Fire Control Symbols																					32,9
NAVY, BUREAU OF SHIPS PUBLICATIONS (NAVSHIPS)																						
NAVSHIPS 250-660-42	Electric Shock Causes and Prevention																					32,9
NAVSHIPS 91727	Electronic Test Equipment Application Guide																					32,9
NAVSHIPS 94324	Shipboard Electronic Equipment Maintainability Design Criteria																					32,9
MARINE CORPS PUBLICATIONS																						
MCO 4110.1A	Standard Integrated Support Management System (SISMS)	6/77	•		●	●	●									▲			▲	▲		13,32
MCO P4855.4A	Procurement Quality Assurance	8/76	•	●	●	●	●												▲	▲		30,32
MCO 5215.1B	Interservicing of TMs & Related Technology	12/76	T	●	●	●	●													▲		29
SG 1	Technical Manual Preparation Style Guide		T																			9
NAVY, OTHER PUBLICATIONS																						
NAVEXOS P-35	Navy Publications and Printing Regulations																					32,9

OTHER

REQUIREMENTS AND GUIDELINES DOCUMENTS				SERVICE APPLICABILITY				EQUIPMENT						MANUAL TYPE		REQUIREMENTS						
																PREPARER						
NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	DOD	USAF	ARMY	NAVY	AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	OPERATION	MAINTENANCE	ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	REFERENCE NOTES
AERONAUTICAL REQUIREMENTS (AR)																						
AR 30	Aeronautical Systems & Equipment Integrated Logistics Support (ILS)	12-73	•																			32,9
AIR FORCE NAVY AERONAUTICAL BULLETINS (ANA B)																						
ANA B 226	Aircraft Lubricant Compounds & Fluids Use Guide	?	?																			32.3.9
FEDERAL SPECIFICATIONS																						
PPP S 30	Cushioned Paper Shipping Sacks	?	?																			32,9
L T 90	Pressure Sensitive Adhesive Tape	?	?																			32,9
PPP T 97	Filament Reinforced Pressure Sensitive Adhesive Tape	?	?																			32.9
L P 387	Thermosetting Laminated Plastic Sheet	?	?																			32.9
PPP B 636	Fiberboard Boxes	?	?																			32,9
PUBLICATIONS, OTHER GOVERNMENT																						
AFHRL TR 73-43(I)	Organizational & Intermediate Maintenance Fully Proceduralized Job Performance Aids (FPJPA)	12-73	T					@	@	@	@	@	@		▲	▲	▲	▲	▲		▲	40,
AFHRL TR 73-43(II)	Fully Proceduralized JPA Developer's Handbook	12-73	T					@	@	@	@	@	@		▲	▲	▲	▲	▲		▲	41,
AFHRL TR 73-43(III)	Fully Proceduralized JPA Manager's & Training Specialist's Handbook	12-73	T					@	@	@	@	@	@		▲	☆	☆	☆	☆	▲	▲	41,
AFHRL TR 79-49	Logic Tree Troubleshooting Aids (LTTA)	11-79	T					@	@	@	@	@	@		▲	△	△		▲	▲	▲	40
AFHRL TR 79-50	Maintenance Task Identification & Analysis	12-79	T					@	@	@	@	@	@		▲	▲			▲	▲		40
AMSDL	(Data Item List)	?	?																			32.9
FAA 1120.35A	Airway Facilities Service Maintenance Technical Handbooks	8-78	T										▲		▲	△	▲	▲				
FAA D 2494-1a	Electronic Equipment Technical Instruction Book Manuscripts	7-75	T										▲				▲	▲	▲	△	▲	
FAA D 2494-2a	Electronic, Electrical & Mechanical Equipment Technical Instruction Book Reproducible Copy & Original Artwork	1-77	T										▲				▲		▲			
JCS Pub 1	Dictionary of U.S. Military Terms for Joint Usage	?	?																			32.9
TO 2	Technical Data & Standardization Glossary	12-66	•																			32.9
USPS STD 101	Symbolic Integrated Maintenance Manuals (SIMM)	6-73	T										▲		▲		▲	▲	▲	▲	▲	
USPS M-328A	Reduction Bar Postal Systems & Equipment Operation & Maintenance	6-76	T										▲	▲	▲		▲	▲	▲			
WR65A	Surface Missile Systems (SMS) Maintenance Analysis & Documentation	1-66	•																			32.9
WS4614	Surface Missile Systems (SMS) Technical Manuals	1-66	T																			9

OTHER – INDUSTRY PUBLICATIONS

REQUIREMENTS AND GUIDELINES DOCUMENTS: NUMBER AND REVISION	SUBJECT	LATEST ISSUE DATE	FSC	SERVICE APPLICABILITY: DOD	USAF	ARMY	NAVY	EQUIPMENT: AIRCRAFT	MISSILE/SPACE	C-E-M EQUIPMENT	SHIPS	GROUND VEHICLE	OTHER & SUPPORT	MANUAL TYPE: OPERATION	MAINTENANCE	REQUIREMENTS: PREPARER: ANALYSIS	STYLE/FORMAT	CONTENT	QUALITY ASSUR.	ACQUISITION	JPA FORMAT OPTIONS	REFERENCE NOTES
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS																						
ANSI X3 5	Flowchart Symbols & Their Usage in Information Process	?	•			○																32;9
ANSI Y14 15	Electrical & Electronic Diagrams	1966	•		○	○																32;9
ANSI Y32 2	Electrical & Electronics Diagrams Graphic Symbols	1975	•			○	○															39;9
ANSI Y32 9	Architectural & Building Wiring & Layout Graphic Symbols	1972	•		○																	32;9
ANSI Y32 10	Fluid Power Diagrams Graphic Symbols	?	•				○															32;9
ANSI Y32 14	Logic Diagram Graphic Symbols	?	•			○																32;9
ANSI Y32 16	Electrical & Electronic Parts & Equipment Reference Designations	1975	•		○	○																32;9
INSTITUTE FOR ELECTRICAL & ELECTRONIC ENGINEERS (IEEE) PUBLICATIONS																						
IEEE 315	Electrical & Electronic Diagram Graphic Symbols	?	?																			32;9
PUBLICATIONS, OTHER, NONGOVERNMENT																						
	Uniform Freight Classification Rules	?	•																			32;9
	Nondestructive Testing Han[illegible] C McMaster ed	?	•																			32;9

SECTION 8. SPECIFICATIONS AND STANDARDS CROSS-REFERENCE TABLES

This section provides a selection of tables containing reference data applicable to specifications, standards, and other requirements and guidelines documents. The purpose of these tables is to provide quick reference to specific information about a particular document to relieve the TO Specialist of the necessity of reviewing each document personally when it may not contain data relevant to his needs.

The following tables are included herein:

Table 8-1.–TO Preparation Specifications Used by the Air Force and Listed in Air Force Acquisition Documents (AFADs)

Table 8-2.–Navy TM Specification Systems (*Ref. 63*)

Table 8-3.–Survey of Navy Specification Systems (*Ref. 63*)

Table 8-4.–Army TM Specification Systems (*Ref. 63*)

Table 8-5.–Survey of Army Specification Systems (*Ref. 63*)

Table 8-6.–Air Force Specification Systems (*Ref. 63*)

Table 8-7.–Survey of Air Force Specification Systems (*Ref. 63*)

Table 8.8.–Requirements and Guidelines Documents for the Preparation of Job Performance Aids Format Options

Table 8-1. – TO Preparation Specifications Used by the Air Force and Listed in Air Force Acquisition Documents (AFADs)

SPECIFICATIONS USED BY THE AIR FORCE FOR THE PREPARATION OF TECHNICAL ORDERS [a]		SPECIFICATIONS LISTED IN SERIES 71 - 531 AFADS											101DT
		(1)	(3)	(4)	(10)	(12)	(14)	(16)	(18)	(19)	(25)	(31)	
NUMBER	TITLE	2/74	12/72	6/76	6/76	6/76	(c)	7/76	7/76	2/71	7/76	7/76	(b)
MIL-M-5096D	Inspection and Maintenance Requirements Manuals; Work Cards, Acceptance and Functional Check Flight Procedure Manuals and Checklists; Inspection Sequence Charts	●	●			●							●
MIL-M-5166C	Assembly, Servicing, and Organizational Maintenance		●			●							●
MIL-M-5288F	Cargo Loading and Offloading	●											●
MIL-M-5920C	Basic Weight Checklist and Loading Data	●											●
MIL-M-6675A	Buildup Instructions, Aircraft Power Package	●											●
MIL-M-7298C	Commercial Equipment		●							●			●
MIL-N-7384C	Notices: Contractor Furnished Equipment												●
MIL-M-7700C	Flight Manuals	●				●							●
MIL-L-8031D	List of Applicable Publications	●	●			●						●	●
MIL-M-8074B	Inspection Requirements (Training Devices)												●
MIL-M-8910	Illustrated Parts Breakdown		○										
MIL-C-9851B	Checkout and Servicing Sheet (Nonreparable Equipment)		●	●									●
MIL-M-9854B	Structural Repair	●				●							●
MIL-M-9864B	Organizational Maintenance		○										○
MIL-C-9883B	Checklist: Organizational Maintenance (Ballistic Missiles)		●										●
MIL-M-9891A	Field Maintenance and Depot Overhaul (Missile Components)		●	●									●
MIL-M-9901A	Manuals, Technical: Tapes; and Cards	●	●	●	●	●		●	●				●
MIL-M-9910A	Operation and Maintenance with Parts Breakdown (Quick Reaction Capability Equipment)		●										●
MIL-M-9913A	Inspection, Repair, Packing (Parachutes)												●
MIL-C-9927A	*Checklist: Organizational Maintenance*	●		●		●							●
MIL-M-9977F	Loading: Nuclear and Nonnuclear Munitions (Tactical Aircraft)	●											●
MIL-M-9991B	Operation and Maintenance (Mobile Training Sets and Part Task Trainers)												●
MIL-M-20800	Nuclear Weapons												○
MIL-M-22202C	Aircraft Cross Servicing Guide												●
MIL-M-24100B	Manuals, Technical: Functionally Oriented Maintenance Manuals												●
MIL-M-25095A	Intermediate Maintenance (Avionics)		●	●									●
MIL-W-25140A	Weight and Balance Control System												●
MIL-M-25393A	Intermediate Maintenance (Airborne Mechanical Equipment)		●	●									●
MIL-M-25394A	Overhaul Instructions and Intermediate Maintenance Instructions (Engines)		●										●
MIL-T-25802F	Technical Manual, Loading and Transport of Nuclear Weapon Cargo in Cargo Aircraft, Preparation Of	●											●
MIL-M-25832G	Delivery, Air to Air, Nuclear Weapons	●											●
MIL-T-25848B	Delivery, Air to Ground, Special Weapons (Strategic Bomber Aircraft)	●											●
MIL-M-26788C	Operation and Maintenance Instructions (Vehicles)		●										●
MIL-T-27018E	Loading, Special Weapons (Fighter Interceptor Aircraft)	●											●
MIL-M-27026E	Delivery, Level, Nuclear Weapons (Strategic Bomber Aircraft)	●											●
MIL-C-27278B	Checklists: Flight Crew	●											●
MIL-M-27579D	Delivery, Multimode Nuclear Weapons (Tactical Aircraft)	●											●
MIL-M-27586C	Loading, Nuclear Munitions (Strategic Bomber Aircraft)	●											●
MIL-T-27594A	Assembly, Test and Storage (Missile Warhead)												●
MIL-M-38311A	Operation Instructions and Checklist		●										●
MIL-M-38312A	Real Property Installed Equipment (Equipment)												●
MIL-M-38313A	Real Property Installed Equipment (System)												●
MIL-M-38384A	Delivery, Nonnuclear Weapons	●											●
MIL-M-38413A	Air Refueling Procedures	●											●
MIL-M-38701	Inspection Requirements: Manuals and Work Cards		●										●
MIL-M-38716A	Loading: Nonnuclear Munitions (Strategic Aircraft)	●											●
MIL-M-38717B	Work Unit Code Manuals											●	●
MIL-C-38720A	Checklist Intermediate Maintenance (Bench Check) (Airborne Armament and Electronic Equipment)												●
MIL-M-38733B	Operation Instructions (Hand Held Flight Computers)												●
MIL-M-38768A	Work Unit Code Manuals (Surface Launched Missiles)		●										●
MIL-M-38769B	Work Unit Code Manuals	●				●							●
[illegible]	[illegible] Manuals and Work Cards; CEM		●									●	●

MIL-M-38312A	**Real Property Installed Equipment (Equipment)**												●
MIL-M-38313A	Real Property Installed Equipment (System)												●
MIL-M-38384A	Delivery, Nonnuclear Weapons	●											●
MIL-M-38413A	Air Refueling Procedures	●											●
MIL-M-38701	Inspection Requirements: Manuals and Work Cards		●										●
MIL-M-38716A	Loading: Nonnuclear Munitions (Strategic Aircraft)	●											●
MIL-M-38717B	Work Unit Code Manuals											●	●
MIL-C-38720A	Checklist Intermediate Maintenance (Bench Check) (Airborne Armament and Electronic Equipment)												●
MIL-M-38733B	Operation Instructions (Hand Held Flight Computers)												●
MIL-M-38768A	Work Unit Code Manuals (Surface Launched Missiles)		●										●
MIL-M-38769B	Work Unit Code Manuals	●				●							●
MIL-M-38777A	Inspection and Lubrication Requirements: Manuals and Work Cards: CEM		●									●	●
MIL-C-38778A	Checklists: Title Page, List of Effective Pages, Printing, and Binders					●							●
MIL-M-38780	Nondestructive Inspection	●	●			●							●
MIL-M-38781D	Storage and Maintenance Procedures (Nonnuclear Munitions)	●											●
MIL-C-38782	Checklists: Operational Readiness and Serviceable Condition; Preparation of												●
MIL-M-38783A	Work Unit Code Manuals (Air Launched Missiles)					●							●
MIL-M-38784A	Manuals, Technical: General Style and Format Requirements		●							●	●		●
MIL-M-38786A	Work Unit Code Manuals (Training Equipment)												●
MIL-M-38787	Missile Motors												●
MIL-M-38788A	Work Unit Code Manuals (Aerospace Ground Equipment)										●		●
MIL-M-38789A	Overhaul Instructions, and Overhaul Instructions with Parts Breakdown (Equipment and Accessories)		●	●	●	●		●					●
MIL-P-38790	Printing Production									●	●		●
MIL-M-38791A	Engineering Installation Facility Standards: CEM											●	●
MIL-M-38792A	Nonnuclear Explosive Ordnance Disposal Procedures (Aircraft Weapon Systems)												○
MIL-M-38793	Calibration Procedures	●	●	●	●	●		●				●	●
MIL-S-38794A	Source Data, Nonnuclear Munitions												●
MIL-M-38795A	Corrosion Control												●
MIL-M-38796A	Organizational, Intermediate, and Depot Overhaul Instructions (Shipping and Storage Containers, Nonnuclear Munitions)												●
MIL-M-38797	Operation and Maintenance Instructions (Various Types of Equipment)		●	●	●	●		●					●
MIL-M-38798B	Operation Instructions, Maintenance Instructions, Circuit Diagrams, Alignment Procedures, and Installation Planning											●	●
MIL-M-38799	Schematic Block Diagrams (SBD) and Maintenance Dependency Charts (MDC)	●											●
MIL-M-38800A	Organizational Maintenance (For Aircraft)	●				●							●
MIL-M-38801	Manual, Technical Aircraft Emergency Rescue Information (Fire Protection)												●
MIL-M-38802	Microfilming	○	○										
MIL-T-38804	Time Compliance Technical Orders	●	●	●	●	●		●	●			●	●
MIL-M-38805	Work Unit Code Manuals Nuclear and Nonnuclear Weapons												●
MIL-M-38807	Illustrated Parts Breakdown	●		●	●	●		●		●		●	●
MIL-M-38811	M.P.T.O.												●
MIL-M-38812	Maint./Overhaul (Automotive Equip.)												●
MIL-M-38813	Storage Manuals												●
MIL-M-63010	DOD Standard Generator Sets												●
MIL-M-82376A	Operation and Maintenance Instructions (Training Devices)												●
MIL-M-83127A	Sensor Exploitation												●
MIL-M-83493	RPV Org. Maint. Instructions												●
MIL-M-83495	Org. Maint. Manual Set												●
MIL-M-83496	Manuals, Technical: Organizational Maintenance (CMG)												●
MIL-M-83498	Manuals, Technical: Testing Aircraft Power Package (QEC)												●
MIL-M-83499	Title Pages, Flt. Manuals; Safety and Op. Supplements												●
MIL-B-83931	Binders, Flexible												●
MIL-M-87138	Aircraft Structural Integrity												●
MIL-M-87929	Maint. Inst. in Work Package Format for Engines												●
MIL-STD-1752	Reading Level Requirements												●

LEGEND: ● Listed as active specification in DODISS(d).
○ Not listed in DODISS(d); Inactive or canceled.

NOTES: (a) Listed in either the LOLDT Spec List Exhibit or the AFAD 71-531 Series.
(b) LOLDT Spec List Exhibit dated 2 July 1979.
(c) Not Reviewed.
(d) DODISS: Department of Defense Index of Specifications and Standards, 1 July 1979 and Supplement dated 1 March 1980.

Table 8-2.—Navy TM Specification Systems (Ref. 63)

Specification/Document: Number	Title	Date	NAVSEA: Equipment and Systems (Conventional Manuals)	NAVSEA: Equipment and Systems (FOMM Manuals)	NAVSEA: MRC's and MIP's	NAVSEA: Overhaul Manuals	NAVELEX: Equipment and Systems (Conventional Manuals)	NAVELEX: Equipment and Systems (FOMM Manuals)	NAVELEX: MRC's and MIP's	NAVELEX: Overhaul Manuals	NAVAIR Conventional: Launching and Recovery Equipment	NAVAIR Conventional: System/Equipment Maintenance	NAVAIR Conventional: Armament Equipment	NAVAIR Conventional: Airborne Weapons	NAVAIR Conventional: Missiles and Guided Weapons	NAVAIR Conventional: Support Equipment	NAVAIR Work Package: Equipment and Component Maintenance	NAVAIR Work Package: Periodic Maintenance Requirements MRC's
MIL-M-8910A	PREPARATION OF TECHNICAL MANUALS, IPB	4/72									●	●	●					
MIL-M-9868D MIL-M-9868.1A	35MM MICROFILMING OF ENGINEERING DOCUMENTS	10/70	●	●		●	●	●		●								
MIL-M-15071G	CONTENT REQUIREMENTS FOR EQUIPMENT AND SYSTEMS TECHNICAL MANUALS	11/73	○			●	○			●								
MIL-M-21742A	CONTENT REQUIREMENTS FOR TECHNICAL MANUALS, OVERHAUL OF ELECTRONIC AND IC EQUIPMENT	2/71	●			○	●			○								
MIL-M-23306	TECHNICAL MANUALS, MAINTENANCE, OVERHAUL AND IPB FOR AIRCRAFT LAUNCHING AND RECOVERY EQUIPMENT	7/76									○							
MIL-M-23618E	PREPARATION OF PERIODIC MAINTENANCE REQUIREMENTS	11/76																○
MIL-M-24100B	FUNCTIONALLY ORIENTED MAINTENANCE MANUALS (FOMM) FOR EQUIPMENT AND SYSTEMS	1/74		○		●		○		●								
MIL-M-24365A	MAINTENANCE ENGINEERING ANALYSIS PROCEDURES AND DOCUMENT REQUIREMENTS	7/70	●			●	●			●								
MIL-P-28760	PREPARATION AND CONTENTS OF MRC'S AND MIP'S	2/71							○									
MIL-M-38784A	TECHNICAL MANUALS, GENERAL STYLE AND FORMAT REQUIREMENTS	8/76	●	●	●	●	●	●	●	●	●	●	●	●				
MIL-P-38790	GENERAL REQUIREMENTS FOR PRINTING AND PRODUCTION OF TECHNICAL MANUALS	5/76	●	●		●	●	●		●	●	●	●	●				
MIL-M-81203A	IN-PROCESS REVIEWS, VALIDATION, AND VERIFICATION	12/67									●	●	●	●	●	●	●	●
MIL-M-81260A	TECHNICAL MANUALS, AIRCRAFT/SYSTEM/EQUIPMENT MAINTENANCE	10/71										○						
MIL-M-81700	TECHNICAL MANUALS, AIRBORNE ARMAMENT EQUIPMENT	9/68											○					
MIL-M-81701B	TECHNICAL MANUALS, AIRBORNE MISSILES AND GUIDED WEAPONS (MICROFORM COMPATIBLE)	3/76													○			
MIL-M-81702A	TECHNICAL MANUALS, GENERAL AIRBORNE WEAPONS (CONVENTIONAL)	7/72												○				
MIL-M-81748A	RAPID ACTION CHANGES	1/75									●							●
MIL-M-81919	TECHNICAL MANUALS, SUPPORT EQUIPMENT (MICROFORM COMPATIBLE)	7/73														○		
MIL-M-81927	GENERAL PREPARATION OF TECHNICAL MANUALS (MICROFORM COMPATIBLE)	2/76													●	●	●	
MIL-M-81928	TECHNICAL MANUALS, AIRCRAFT EQUIPMENT AND COMPONENT MAINTENANCE (MICROFORM COMPATIBLE)	2/76															○	
MIL-M-81929	TECHNICAL MANUALS, IPB'S (MICROFORM COMPATIBLE)	2/76													●	●	●	
MIL-M-81930	REQUIREMENTS FOR MICROFILM OF TECHNICAL MANUALS, 16MM MASTERS	2/74													●	●	●	
MIL-M-82627A	DEVELOPMENT AND PREPARATION OF MRC'S AND MIP'S	6/80			○													
AR-30	ILS REQUIREMENTS FOR AERONAUTICAL SYSTEMS AND EQUIPMENT	12/72																●
WR68A	MAINTENANCE ANALYSIS AND DOCUMENTATION FOR SURFACE MISSILE SYSTEMS PMS/SMS	8/66			●													
WS4616	TECHNICAL MANUALS, PMS/SMS FOR SURFACE MISSILE SYSTEMS	3/66			●													
OPNAV INST 4790.2	NAVAIR MAINTENANCE PROGRAM	12/76																●
NAVAIR 00-25-600	SUPPORT OF IN-PROCESS REVIEW, VALIDATION, AND VERIFICATION	7/80									●	●	●	●	●	●	●	●
NAVAIR 00-25-700	TECHNICAL MANUAL PREPARATION GUIDE FOR WRITERS, EDITORS AND ILLUSTRATORS	6/78													●	●	●	
NAVMAT INST 4790.6	MIP AND MRC STANDARDIZATION HANDBOOK	7/80			●				●									
OPNAV INST 4790.4	MAINTENANCE AND MATERIAL MANAGEMENT MANUAL	2/78							●									

LEGEND:

○ Primary Content Specification

● Supporting Specification or Document

NOTE:
Navy TM specification systems are arranged according to equipment and manual types. All documents contained in each column represent the TM specification system for that category of TM.

Table 8-3.—Survey of Navy Specificatio

Section	MANUAL REQUIREMENT \ SPECIFICATION SYSTEM	NAVSEA/NAVELEX Conventional Manuals	NAVSEA/NAVELEX [illegible] Manuals	NAVSEA/NAVELEX [illegible] Manuals	NAVSEA MRCs and MIPs	NAVELEX MRCs and MIPs	NAVAIR Conventional Manuals: Launching and Recovery Equipment	NAVAIR Conventional Manuals: Maintenance Systems Equipment	NAVAIR Conventional Manuals: Armament Eq[...]
STYLE AND FORMAT	GENERAL REQUIREMENTS	(2) (2)	(2) (2)	(2)	2 (2)	(1) (1) (1)	(2) (2)	(2)	2
	TYPOGRAPHY	(3) (3)	(3)	(3)	1		(3)	3	(3)
	PRINTING	3	(3)	(3)				(3)	(3)
	LITHOGRAPHIC NEGATIVES	3	(8)	(3) (3)			(3)	(3)	(3)
	MANUAL PAGE SIZE	(3)	(3)	(3)			(2)	(2)	(2)
	MANUAL DIVISIONS	2 2	3	[illegible]			(2)	(3)	[illegible]
	NUMBERING	2		(2) (2)			(2)	2	(2)
	APPENDIXES	(3) (3)	(3)					(3)	3
	INDEX	(2) (2)	(2)				(2)	2	(2)
	REFERENCES	(2)	(2)		(1)			2	(2)
	ILLUSTRATION REQUIREMENTS	(2) (2)	(2) (2) (2)	2	(2)	(2) (2)	(2)	(2) (2)	(2)
	CHANGES/REVISIONS	3 3	(2) (2) (2)	(3) (3)	2		(2) (2)		
	SUPPLEMENTS		(2)	(2) (2)				(3)	
	MICROFORM COMPATABILITY	(3) (3)	3	(3) (3) (3)					
CONTENT	FRONT MATTER	3 3	(2) (2)	(3) (3)			2 (2)	(3)	(2)
	BOOKPLAN/OUTLINE	3 (A) 3	3 (A)	(2)					
	MAINTENANCE PLAN	(2) (A)	(2) (A)		2 (B)	(3)		(3)	
	DATA CONTENT	(2) (A)	(2) (2)	(2)	2 (B)	(3) (B)	(2)	(3)	
	PARTS LIST	3	(2)	(2)			3 (3)	(3)	(3)
	ILLUSTRATION DIAGRAM USE	(2)	(2)	(2)	(2)	(2)	(1)	(2)	
	SAMPLE TEXT			(2)					
	SAMPLE TABLES	2	(2)	(2)			(2)		
	SAMPLE ILLUSTRATIONS	(2)	(2)	(2)			(2)	(2)	
	PREPARATION GUIDE			(2)		(3)			
READABILITY/COMPREHENSION	[illegible]		2			(2)			
	INFORMATION COMPRESSION			(3)	3	(3)			
	LEVEL OF WRITING	2	2				(2) (2)	(2)	
	[illegible]			2			(2)	(2)	(1)
	READABILITY REQUIREMENTS								
	VOCABULARY GUIDE					3			
QUALITY ASSURANCE	QUALITY PROGRAM	(2)	1	1			(3) (3)	(2) 3	
	IN-PROCESS REVIEW	(2)					(3) (3)	(3) (3)	
	VALIDATION/VERIFICATION	2				(2)	(2) (3)	(3) (3)	
	VALIDATION OF READABILITY								
	APPROVAL AND ACCEPTANCE	(3)						3	
	PREPARATION FOR DELIVERY	3		1			1	(3)	

...of *Navy Specification Systems* (Ref. 63)

...AIR[illegible] NAVAL MANUALS																NAVAL [illegible] MANUALS																			NAVAIR/[illegible]						
...TENANCE ...EMS EQUIPMENT				ARMAMENT EQUIPMENT						AIRBORNE WEAPONS						MISSILES AND [illegible] WEAPONS							[illegible] EQUIPMENT						EQUIPMENT AND COMPONENTS						PERIODIC MAINTENANCE REQUIREMENTS MANUALS						
MIL-P-38790	MIL-M-81[illegible]	MIL-M-81[illegible]	NAVAIR [illegible]	MIL-M-8[illegible]	MIL-M-38784A	MIL-P-38790	MIL-M-81[illegible]	MIL-M-[illegible]	NAVAIR [illegible]	MIL-M-38784A	MIL-P-38790	MIL-M-81[illegible]	MIL-M-81[illegible]	NAVAIR [illegible]	MIL-M-[illegible]	MIL-M-81[illegible]	MIL-M-8192	MIL-M-8192[illegible]	MIL-M-[illegible]	NAVAIR [illegible]	[illegible]	MIL-M-[illegible]	MIL-M-[illegible]	MIL-M-8[illegible]	MIL-M-8192[illegible]	MIL-M-81[illegible]	NAVAIR [illegible]	MIL-M-81[illegible]	MIL-M-81[illegible]	MIL-M-81928	MIL-M-81429	MIL-M-[illegible]	NAVAIR [illegible]	MIL-M-[illegible]	MIL-P-38790	MIL-M-81203A	MIL-M-81484	NAVAIR 00-25-400	OPNAV 4790.2	AR [illegible]

LEGEND

(1) VAGUE, INADEQUATE, OR CONFUSING

(2) ADEQUATE BUT SUBJECT TO INTERPRETATION

(3) EXPLICIT

A IF INVOKED BY CONTRACT

B IF REQUIRED BY PROCURING AGENCY

C IF AUTHORIZED BY PROCURING AGENCY

(D) AVAILABLE BUT NOT REFERENCED IN PRIMARY SPECIFICATION

E SUPPLIED BY PROCURING AGENCY

(F) PER CONTRACT

R FOR REFERENCE

NOTE Table shows an evaluation of the [illegible]tiveness [illegible] repre[illegible]ative Navy TM specification systems in providing Navy TM requirements

Table 8-4.—Army TM Specification Systems (Ref. 63)

NUMBER	TITLE	DATE	MECHANICAL AND CONSTRUCTION EQUIPMENT, AUTOMOTIVE EQUIPMENT, AND POWER TOOLS	MUNITIONS EQUIPMENT	TELECOMMUNICATIONS EQUIPMENT	RADAR EQUIPMENT	AIRCRAFT ELECTRONICS EQUIPMENT	PHOTOGRAPHIC, MOTION PICTURE, SOUND, AND RECORDING EQUIPMENT	ELECTRONIC TEST EQUIPMENT	AIRCRAFT MAINTENANCE	AERONAUTICAL ACCESSORIES AND SUPPORT EQUIPMENT, MAINTENANCE AND OVERHAUL	AIRCRAFT ENGINES AND ACCESSORIES MAINTENANCE	WEAPONS, COMBAT VEHICLES, AND FIRE CONTROL MATERIAL	MISSILE SYSTEMS: EQUIPMENT CHECK PROCEDURES	MISSILE SYSTEMS: UNIT UNDER TEST PROCEDURES	MISSILE SYSTEMS: EQUIPMENT	OPERATORS MANUALS (ALL EQUIPMENT TYPES EXCEPT AIRCRAFT)	MICROFICHE MANUALS
MIL-M-38748A	REQUIREMENTS FOR MICROFICHE	12/70																●
MIL-M-38784A	TECHNICAL MANUALS GENERAL REQUIREMENTS	9/76	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MIL-M-63000C	TECHNICAL MANUALS GENERAL REQUIREMENTS FOR MANUSCRIPTS	9/71			●		●	●	●		●	●		●	●	●		●
MIL-M-63001E	TECHNICAL MANUALS REPAIR PARTS AND SPECIAL TOOLS LIST	12/75	●	●	●	●	●	●	●		●	●	●			●		
MIL-M-63004B	TECHNICAL MANUALS PREPARATION OF LUBRICATION ORDERS	5/76				●							●				●	
MIL-M-63008C	TECHNICAL MANUALS MECHANICAL AND CONSTRUCTION EQUIPMENT, AUTOMOTIVE EQUIPMENT, AND POWER TOOLS	6/76	○															
MIL-M-63018	TECHNICAL MANUALS MUNITIONS EQUIPMENT	11/75		○														
MIL-M-63019	TECHNICAL MANUALS TELECOMMUNICATIONS EQUIPMENT	8/76			○													
MIL-M-63020A	TECHNICAL MANUALS, RADAR EQUIPMENT	8/76				○												
MIL-M-63022	TECHNICAL MANUALS AIRCRAFT ELECTRONIC EQUIPMENT	11/75					○											
MIL-M-63024	TECHNICAL MANUALS PHOTOGRAPHIC, MOTION PICTURE, SOUND, AND RECORDING EQUIPMENT	11/75						○										
MIL-M-63026	TECHNICAL MANUALS ELECTRONIC TEST EQUIPMENT	1/75							○									
MIL-M-63026A	TECHNICAL MANUALS ARMY AIRCRAFT MAINTENANCE	12/75								○		●						
MIL-M-63027	TECHNICAL MANUALS MAINTENANCE AND OVERHAUL OF AERONAUTICAL ACCESSORIES AND SUPPORT EQUIPMENT	7/71									○							
MIL-M-63028	TECHNICAL MANUALS MAINTENANCE REQUIREMENTS FOR MAINTENANCE OF AIRCRAFT ENGINES AND ACCESSORIES	9/69										○						
MIL-M-63030B	PREVENTIVE MAINTENANCE MANUALS	5/73			●	●		●	●									
MIL-M-63032B	TECHNICAL MANUALS WEAPONS COMBAT VEHICLES, AND FIRE CONTROL MATERIAL	6/76											○					
MIL-M-63036	PREPARATION OF OPERATOR'S TECHNICAL MANUALS	5/76															○	
MIL-M-63043	TECHNICAL MANUALS, MISSILE SYSTEM EQUIPMENT CHECK PROCEDURES	5/70												○		●		
MIL-M-63044	TECHNICAL MANUALS MISSILE SYSTEM EQUIPMENT UNIT UNDER TEST PROCEDURES	3/76													○	●		
MIL-M-63046	TECHNICAL MANUALS MISSILE SYSTEM EQUIPMENT	11/76														○		
MIL-M-63048A	PREPARATION OF EQUIPMENT PUBLICATIONS ON MICROFICHE	9/74																○
MIL-M-63050	COMPONENTS OF END ITEM BASIC ISSUE ITEMS ADDITIONAL AUTHORIZATION AND EXPENDABLE SUPPLIES LISTS	5/76	●		●	●							●				●	
TM 38-750	ARMY MAINTENANCE MANAGEMENT SYSTEM (JAMMS)	11/72	●	●	●		●	●	●	●	●					●	●	
TM 55-406-9	ARMY AVIATION MAINTENANCE ENGINEERING MANUAL	8/66								●								
TM 55-1500-204-25/1	GENERAL AIRCRAFT MAINTENANCE MANUAL	4/70			●	●		●	●	●								
TM 55-1500-328-25	AERONAUTICAL EQUIPMENT MAINTANANCE MANAGEMENT POLICIES AND PROCEDURES	7/72								●								
AR750-1	ARMY MATERIAL MAINTENANCE CONCEPTS AND POLICIES	5/72								●								

LEGEND:

○ Primary Content Specification

● Supporting Specification or Document

NOTE:

Army TM specification systems are arranged according to equipment types. All documents contained in *each column* represent the TM specification system for that category of TM

Table 8-5.—Survey of Army Specification Systems (Ref

Category	Manual Requirement \ Specification System	[illegible] EQPT AND PWR: MIL-M-38784A	MIL-M-630[illegible]	MIL-M-630[illegible]	MIL-M-630[illegible]	MUNITIONS EQUIPMENT: MIL-M-38784A	MIL-M-630[illegible]	MIL-M-630[illegible]	TELECOMMUNICATIONS EQUIPMENT: MIL-M-38784A	MIL-M-63000	MIL-M-630[illegible]	MIL-M-63019	MIL-M-63030P	MIL-M-63050	RADAR EQUIPMENT: MIL-M-38784A	MIL-M-63001E	MIL-M-63004P	MIL-M-63025A	MIL-M-63030F	MIL-M-63050
STYLE AND FORMAT	GENERAL REQUIREMENTS	2		2		2		2	2			2			2			2		
	TYPOGRAPHY	1				1			1						3					
	PRINTING																			
	LITHOGRAPHIC NEGATIVES																			
	MANUAL PAGE SIZE	1				1			1						3					
	MANUAL DIVISIONS	2				2			2			3			2					
	NUMBERING	2													2					
	APPENDICES	1	1	1	1	3	3	3	3	3	3			3	3	3				3
	INDEX	2													2					
	REFERENCES	2				2			2						2					
	ILLUSTRATION REQUIREMENTS	2													2					
	CHANGES/REVISIONS	3				3			1						3					
	SUPPLEMENTS	2				2			2						2					
	MICROFORM COMPATABILITY							C				C						C		
CONTENT	FRONT MATTER	3		1		3		3	1	1					3					
	BOOKPLAN/OUTLINE	3				3			3						3					
	MAINTENANCE PLAN			B				B				B						B		
	DATA CONTENT			1				1				2	2				3	2	2	
	PARTS LIST		3				3				1					3				
	ILLUSTRATION/DIAGRAM USE			1								2					1	2		
	SAMPLE TEXT																			
	SAMPLE TABLES			2				2				2	3				3	2	3	
	SAMPLE ILLUSTRATIONS	2		1		2			2			2	2		2		3	2	2	
	PREPARATION GUIDE																			
READABILITY/COMPREHENSIBILITY	JOB RELEVENCY																			
	INFORMATION COMPRESSION																			
	LEVEL OF WRITING	1		1		1		1	1						1			1		
	STYLE OF WRITING	2				2			2						2			1		
	READABILITY REQUIREMENTS	3				3			3	3					3					
	VOCABULARY GUIDE																			
QUALITY ASSURANCE	QUALITY PROGRAM			3				3	1	3								3		
	IN PROCESS REVIEW			3				3	D									3		
	VALIDATION/VERIFICATION			3				3		3								3		
	VALIDATION OF READABILITY	3				3			3	3					3					
	APPROVAL AND ACCEPTANCE			3		D			D						D					
	PREPARATION FOR DELIVERY	3				3			3						3					

Category	Manual Requirement \ Specification System	AIRCRAFT ELECTRONIC EQUIPMENT: MIL-M-38784A	MIL-M-6300[illegible]	MIL-M-6300[illegible]	MIL-M-630[illegible]	PHOTOGRAPHIC, MTN PICTURE, SOUND AND RECORDING EQPT: MIL-M-38784A	MIL-M-63000	MIL-M-63001F	MIL-M-63024	MIL-M-63030R	ELECTRONIC TEST EQUIPMENT: MIL-M-38784A	MIL-M-63000	MIL-M-63001E	MIL-M-63025	MIL-M-63030F	AIRCRAFT MAINT: MIL-M-38784A	MIL-M-63026A	AERONAUTICAL AND SUPPORT EQUIPMENT: MIL-M-38784A	MIL-M-63000	MIL-M-63001E	MIL-M-6302[illegible]	AIRCRAFT E AND ENGINE ACCESSORIE: MIL-M-38784A	MIL-M-63000	MIL-M-63001E
STYLE AND FORMAT	GENERAL REQUIREMENTS	2			2	2			2		2			2		2	2	2	2			2	2	
	TYPOGRAPHY	1				3					3					3		3				3		
	PRINTING																							
	LITHOGRAPHIC NEGATIVES																							
	MANUAL PAGE SIZE	3				3					3					3		3				3		
	MANUAL DIVISIONS	2				2					2					2	3	2			3	2		
	NUMBERING	2				2					2					2		2				2		
	APPENDICES	3	3	3		3	3	3			3	3	3			3	2	3	3	3	3	3	3	3
	INDEX	2	2			2	2				2					2		2				2		
	REFERENCES	2				2					2					2		2				2		
	ILLUSTRATION REQUIREMENTS	2	2			2					2					2		2				2		
	CHANGES/REVISIONS	3				3					3					3	3	3				3		
	SUPPLEMENTS	2				2					2					2		2				2		
	MICROFORM COMPATABILITY				C				C					C			C				C			
CONTENT	FRONT MATTER	3	3			3	3				3	3				3		3	3			3	3	
	BOOKPLAN/OUTLINE	3				3					3							3				3		
	MAINTENANCE PLAN				B				B					B			B							
	DATA CONTENT				1				2	2				2	2		2				2			
	PARTS LIST			3				3					3							3	3			3
	ILLUSTRATION/DIAGRAM USE				2									2			3				1			
	SAMPLE TEXT																							
	SAMPLE TABLES				2				1	3				1	3		3				3			
	SAMPLE ILLUSTRATIONS	2			3	2			3	2	2			2	2	2	3	2				2		
	PREPARATION GUIDE																							
READABILITY/COMPREHENSIBILITY	JOB RELEVENCY																							
	INFORMATION COMPRESSION																							
	LEVEL OF WRITING	1			1	1			1		1			1		1		1			1	1		
	STYLE OF WRITING	2			1	2			1		2			1		2		2			1	2		
	READABILITY REQUIREMENTS	3				3					3					3		3				3		
	VOCABULARY GUIDE																							
QUALITY ASSURANCE	QUALITY PROGRAM	D				D					D				1	D		D				D		
	IN PROCESS REVIEW	D				D					D					D		D				D		
	VALIDATION/VERIFICATION		3				3					3				D			3				3	
	VALIDATION OF READABILITY	3				3					3					3		3				3		
	APPROVAL AND ACCEPTANCE	D				D					D					D		D				D		
	PREPARATION FOR DELIVERY	3				3					3					3		3				3		

on Systems (Ref. 63)

	Aeronautical and Support Equipment				Aircraft Engines and Engine Accessories					Weapons, Combat Vehicles, and Fire Control Material					Missile Systems: Equipment Check Proc			Missile Systems: Equipment Under Test Proc			Missile Systems: Equipment Manuals						Operators Manuals			
	MIL-M-38784A	MIL-M-63000C	MIL-M-63001E	MIL-M-630[illegible]	MIL-M-38784A	MIL-M-63000C	MIL-M-63001E	MIL-M-63026A	MIL-M-63027B	MIL-M-38784A	MIL-M-63001E	MIL-M-63004B	MIL-M-63027B	MIL-M-63050	MIL-M-38784A	MIL-M-63000C	MIL-M-63043	MIL-M-38784A	MIL-M-63000C	MIL-M-63044	MIL-M-38784A	MIL-M-63000C	MIL-M-63001E	MIL-M-63043	MIL-M-63044	MIL-M-63046	MIL-M-38784A	MIL-M-63004B	MIL-M-63036	MIL-M-63050
	2	2			2	2			2	2			2		2		2	2		2	2					2	2		2	
	3				3					3					3			3			3						3		3	
	3				3					3					3			3			3								A	
	2			3	2			3	3	2			3		2			2			2						2		3	
	2				2					2					2			2			2						2		3	
	3	3	3	3	3	3	3		3	3			3	3	3			3			3					1			3	3
	2				2					2					2			2			2	2					2		3	
	2				2					2					2			2			2								3	
	2				2					2					2			2			2						2		3	
	3				3					3					3			3			3						3			
	2				2					2					2			2			2									
				C					C				C																C	
	3	3			3	3				3					3	3		3	3		3	3							3	
	3				3					3					3			3			3						3			
									B				B																B	
				2				2	2			3	2				1			2				1	2	1		3	3	
			3	3			3				3												3							
				1					2				2							2									3	
													2				2												2	
				3								3	1				2			3						1			3	
	2				2					2		3	3		2		1	2		2	2					1			3	
													2																2	
																													2	
																													2	
	1			1	1			1	1	1			1		1			1			1								3	
	2			1	2			1	1	2			2		2			2			2								3	
	3				3					3					3			3			3						3			
																													3	
	D				D								3		D			D			D								3	
	D				D								3		D			D			D								3	
		3				3							3			3			3			3							3	
	3				3					3			3		3			3			3						3			
	D				D								3		D			D			D								3	
	3				3					3					3			3			3						3			

LEGEND

1. VAGUE, INADEQUATE, OR CONFUSING
2. ADEQUATE BUT SUBJECT TO INTERPRETATION
3. EXPLICIT

A. AS SPECIFIED BY PROCURING AGENCY

B. PROVIDED BY MAINTENANCE ALLOCATION CHART (MAC)

C. WHEN REQUIRED BY PROCURING AGENCY

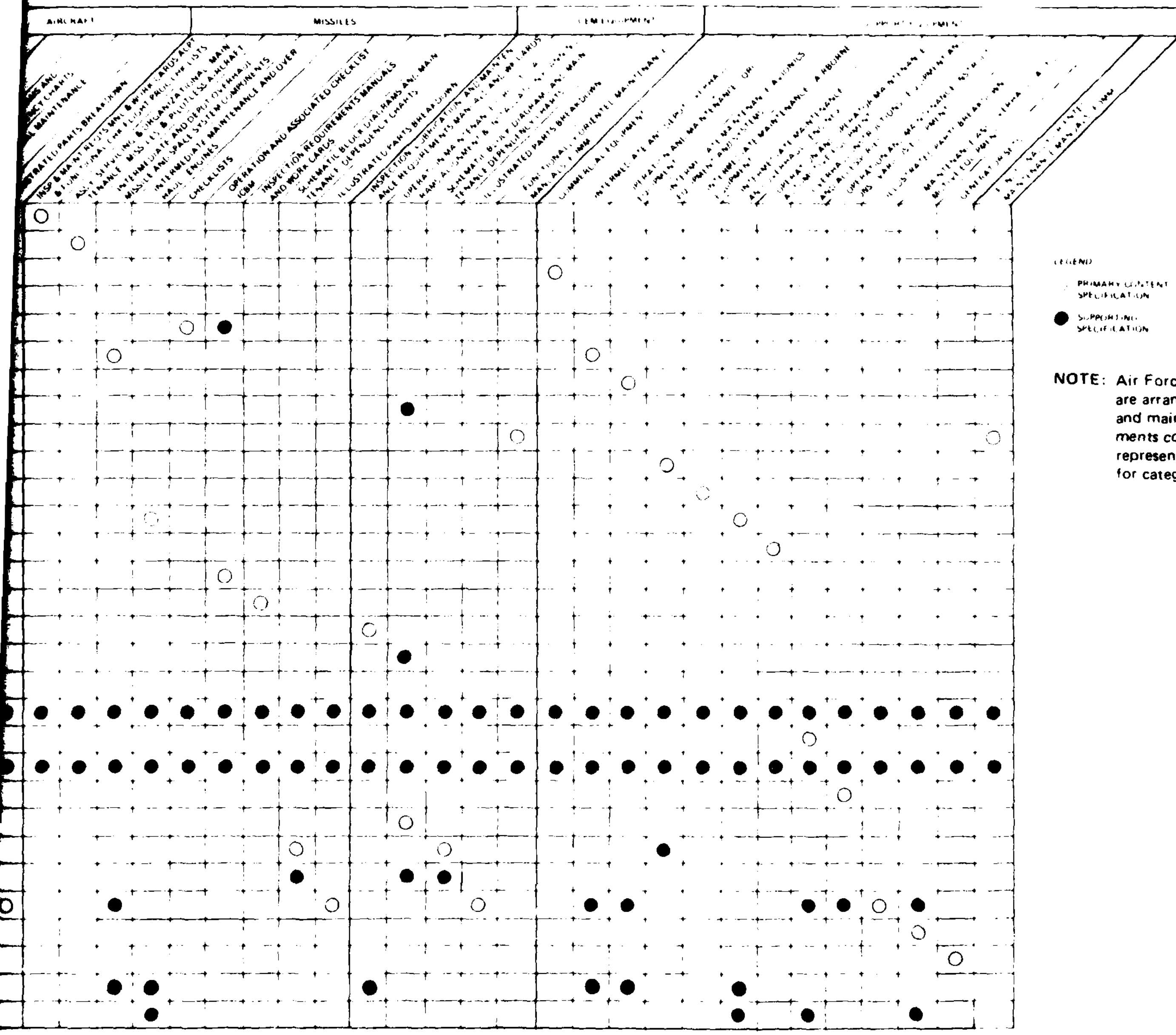
D. QUALITY ASSURANCE PROVISIONS ARE CONFUSING. ORIGINALLY ALL QUALITY ASSURANCE PROVISIONS WERE CONTAINED IN MIL-M-38784(TM). THIS SPECIFICATION WAS SUPERSEDED BY MIL-M-38784A WHICH DOES NOT CONTAIN THE SAME QUALITY ASSURANCE REQUIREMENTS.

NOTE: Table shows the effectiveness of representative Army TM specification systems in providing Army TM requirements.

Table 8-6.—Air Force Specification Systems (R

SPECIFICATION NUMBER	TITLE	DATE	AIRCRAFT: INSP & MAINT REQTS MNL & WORK CARDS ACPT & FUNCTIONAL CHK FLIGHT PROC CHK LISTS	AIRCRAFT: COMMERCIAL EQUIPMENT	AIRCRAFT: STRUCTURAL REPAIR	AIRCRAFT: OVERHAUL AND INTERMEDIATE MAINTENANCE ENGINES	AIRCRAFT: SCHEMATIC BLOCK DIAGRAMS AND MAINTENANCE DEPENDENCY CHARTS	AIRCRAFT: ORGANIZATIONAL MAINTENANCE (AIRCRAFT)	AIRCRAFT: ILLUSTRATED PARTS BREAKDOWN	MISSILES: INSP & MAINT REQTS MNL & WORK CARDS ACPT & FUNCTIONAL CHK FLIGHT PROC CHK LISTS	MISSILES: ASSY SERVICING & ORGANIZATIONAL MAINTENANCE MISSILES & PILOTLESS AIRCRAFT	MISSILES: INTERMEDIATE AND DEPOT OVERHAUL MISSILE AND SPACE SYSTEM COMPONENTS	MISSILES: INTERMEDIATE MAINTENANCE AND OVERHAUL ENGINES	MISSILES: CHECKLISTS	MISSILES: OPERATION AND ASSOCIATED CHECKLIST ICBM	MISSILES: INSPECTION REQUIREMENTS MANUALS AND WORK CARDS	MISSILES: SCHEMATIC BLOCK DIAGRAMS AND MAINTENANCE DEPENDENCY CHARTS	MISSILES: ILLUSTRATED PARTS BREAKDOWN	INSPECTION LUBRICATION AND MAINTENANCE REQUIREMENTS	OPERATION AND MAINTENANCE	SCHEMATIC BLOCK DIAGRAMS AND MAINTENANCE DEPENDENCY CHARTS	ILLUSTRATED PARTS BREAKDOWN	FUNCTIONAL... MANUALS	
MIL M 5096	INSPECTION AND MAINTENANCE REQUIREMENTS MANUALS AND WORK CARDS CHECK FLIGHT PROCEDURE INSPECTION CHART	4/76	○							○														
MIL M 5166C	TECH MANUALS ASSEMBLY SERVICING AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS (GUIDED MISSILES AND PILOTLESS AIRCRAFT)	4/75									○													
MIL M 7298C	TECH MANUALS COMMERCIAL EQUIPMENT	4/76		○																				○
MIL M 9854B	STRUCTURAL REPAIR (AIRCRAFT)	3/75			○																			
MIL C 9883B	ORGANIZATIONAL MAINTENANCE CHECKLIST (BM)	8/69												○	●									
MIL M 9891A	INTERMEDIATE AND DEPOT OVERHAUL (MISSILES AND RELATED EQUIP)	6/75										○												
MIL M 9910A	OPERATION AND MAINTENANCE INSTRUCTIONS WITH PARTS BREAKDOWN (ORC EQUIPMENT)	2/74																						
MIL C 9927A	ORGANIZATIONAL MAINTENANCE CHECKLIST	10/69						●												●				
MIL M 24100B	FUNCTIONALLY ORIENTED MAINTENANCE MANUALS (FOMM)	1/74																					○	
MIL M 25096A	INTERMEDIATE MAINTENANCE AVIONICS EQUIPMENT AND SYSTEMS	1/71																						
MIL M 25393A	INTERMEDIATE MAINTENANCE AIRBORNE EQUIPMENT	2/76																						
MIL M 25394A	INTERMEDIATE MAINTENANCE AND OVERHAUL (ENGINES)	10/71				○							○											
MIL M 26788C	OPERATION AND OPERATOR MAINTENANCE (AUTOMOTIVE EQUIPMENT)	2/74																						
MIL M 38311A	OPERATION AND ASSOCIATED CHECKLIST ICBM	6/74													○									
MIL M 38701	INSPECTION REQUIREMENT MANUALS AND WORK CARDS MISSILE AND SPACE WEAPON SYSTEMS	3/64														○								
MIL M 38777A	INSPECTION LUBRICATION AND MAINTENANCE REQUIREMENT MANUALS AND WORK CARDS CEM EQUIPMENT	6/71																	○					
MIL C 38778A	CHECKLISTS TITLE PAGE LIST OF EFFECTIVE PAGES PRINTING AND BINDERS	7/74						●												●				
MIL M 38780	NON DESTRUCTIVE TESTING	4/73																						
MIL M 38784A	GENERAL STYLE AND FORMAT REQUIREMENTS	9/75	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MIL M 38789A	OVERHAUL INSTRUCTIONS AND OVERHAUL INSTRUCTION WITH IPB VARIOUS EQUIPMENT AND ACCESSORIES	1/73																						
MIL P 38790	GENERAL REQUIREMENTS FOR PRINTING AND PRODUCTION	5/76	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MIL M 38797	OPERATIONS AND MAINTENANCE INSTRUCTIONS VARIOUS TYPES OF EQUIPMENT	11/74																						
MIL M 38798B	OPERATION AND MAINTENANCE INSTRUCTION CIRCUIT DIAGRAMS ALIGNMENT PROCEDURE AND INSTALLATION PLANNING CEM EQUIPMENT	12/75																		○				
MIL M 38799	SCHEMATIC BLOCK DIAGRAMS AND MAINTENANCE DEPENDENCY CHARTS	8/71					○	●									○				○			
MIL M 38800A	ORGANIZATIONAL MAINTENANCE AIRCRAFT	9/74					●	○									●			●	●			
MIL M 38807	ILLUSTRATED PARTS BREAKDOWN	11/74							○			●						○				○		
MIL M 38812	MAINTENANCE AND OVERHAUL INSTRUCTIONS (AUTOMOTIVE EQUIPMENT)	4/74																						
MIL M 63010	DOD STANDARD GENERATOR SETS	1/76																						
MIL M 83490	TITLE PAGES AND LIST OF EFFECTIVE PAGES SAFETY SUMMARY	8/75	●			●						●	●						●					
MIL M 83931	FLEXIBLE BINDERS	1/68				●							●											

Table 8-6.—Air Force Specification Systems (Ref. 63)



LEGEND

○ PRIMARY CONTENT SPECIFICATION

● SUPPORTING SPECIFICATION

NOTE: Air Force TM specification systems are arranged according to equipment and maintenance types. All documents contained in each column represent the TM specification system for category of TM.

Table 8-7. –Survey of Air Force Specificatio

	SPECIFICATION SYSTEM	INSP AND MAINT REQTS CHECK FLIGHT CHECKLISTS ACFT MSLS					STRL REPAIR AIRCRAFT			INTMD MAINT AND OVHL OF ENGS ACFT MSLS AUTOMN					ORGANIZATIONAL MAINT (JOB GUIDES) AIRCRAFT MISSILES						ASSY SERVICING AND ORG MAINT MSLS		
	MANUAL REQUIREMENT	MIL-M-5096C	MIL-M-38784A	MIL-P-38790C	MIL-M-83495	MIL-M-83931	MIL-M-98548	MIL-M-38784A	MIL-P-38790C	MIL-M-75304A	MIL-M-38784A	MIL-P-38790C	MIL-M-83495	MIL-M-83931	MIL-C-9827A	MIL-C-38378A	MIL-M-38784A	MIL-P-38790	MIL-M-38799	MIL-M-38800A	MIL-M-5166C	MIL-M-38784A	MIL-P-38790
STYLE AND FORMAT	GENERAL REQUIREMENTS	2	2					2		2	2						2			2	2	2	
	TYPOGRAPHY		3					3			3						3					3	
	PRINTING			3		3			3			3		3				3					3
	LITHOGRAPHIC NEGATIVES			3					3			3						3					3
	MANUAL/PAGE SIZE	3	3					3			3									3			
	MANUAL DIVISIONS	3	2				3	2		3	2						2			3	3	2	
	NUMBERING	3	2					2			2						2					2	
	APPENDIXES		3				A				3						3					3	
	INDEX		2					2			2						2					2	
	REFERENCES		2					2			2						2					2	
	ILLUSTRATION REQUIREMENTS	1	2					2			2						2					2	
	CHANGES/REVISIONS	1	3					3			3						3					3	
	SUPPLEMENTS		2					2			2						2					2	
	MICROFORM COMPATABILITY																						
CONTENT	FRONT MATTER	3	3		3		3	3			3		3				3					3	
	BOOKPLAN (OUTLINE)		C					C			C											C	
	MAINTENANCE PLAN	2																					
	DATA CONTENT	3					2			2	2				3	3			A	3	2		
	PARTS LIST																						
	ILLUSTRATION/DIAGRAM USE	3					3			2										3	2		
	SAMPLE TEXT	3																		1			
	SAMPLE TABLES	3																		1			
	SAMPLE ILLUSTRATIONS	3																		1			
	PREPARATION GUIDE	2																					
READABILITY COMPREHENSIBILITY	JOB RELEVENCY						2			2										3			
	INFORMATION COMPRESSION																			2			
	LEVEL OF WRITING	1	1				1	1		1	1						1			2	1	1	
	STYLE OF WRITING	2	2				1	2		1	2						2			3		2	
	READABILITY REQUIREMENTS																						
	VOCABULARY GUIDE																			3			
QUALITY ASSURANCE	QUALITY PROGRAM		2					2			2						3					2	
	IN PROCESS REVIEW																						
	VALIDATION/VERIFICATION																						
	VALIDATION OF READABILITY																						
	APPROVAL AND ACCEPTANCE		1					1			1						1					1	
	PREPARATION FOR DELIVERY		3	3				3	3		3	3					3	3				3	3

	SPECIFICATION SYSTEM	INTMD AND DEPOT OVHL MSLS AND SPACE SYSTEM						OPERATION AND CHECKLISTS ICBM				INSPECTION REQUIREMENTS MISSILES				INSPECTION LUBRICATION AND MAINT CEM EQUIPMENT					OPNL CKT ALIG CEM	
	MANUAL REQUIREMENT	MIL-M-9198A	MIL-M-38784A	MIL-P-38790	MIL-M-38807	MIL-M-83495	MIL-M-83931	MIL-C-38838	MIL-M-38311A	MIL-M-38784A	MIL-P-38790	MIL-M-38701	MIL-M-38784A	MIL-P-38790	MIL-M-83931	MIL-M-38777A	MIL-M-38784A	MIL-P-38790	MIL-M-83495	MIL-M-83931	MIL-C-9827A	MIL-C-38778A
STYLE AND FORMAT	GENERAL REQUIREMENTS	2	2						2	2		A	2			2						
	TYPOGRAPHY		3							3			3				3					
	PRINTING			3			3				3			3	3			3		3		
	LITHOGRAPHIC NEGATIVES			3							3			3				3				
	MANUAL/PAGE SIZE		3							3		3	3			3	3					
	MANUAL DIVISIONS	3	2						3	2		2	2			3	2					
	NUMBERING		2							2		1	2			3	2					
	APPENDIXES		3							3			3				3					
	INDEX		2							2			2				2					
	REFERENCES		2						3	2			2				2					
	ILLUSTRATION REQUIREMENTS		2							2			2				2					
	CHANGES/REVISIONS		1							3		2					3					
	SUPPLEMENTS		2							2			2				2					
	MICROFORM COMPATABILITY																					
CONTENT	FRONT MATTER		3			3				3			3				3		3			
	BOOKPLAN (OUTLINE)		C							C			C				C					
	MAINTENANCE PLAN															1						
	DATA CONTENT	2						3	2			2				2					3	[illegible]
	PARTS LIST				3																	
	ILLUSTRATION/DIAGRAM USE	2							A			1	1				1					
	SAMPLE TEXT											2				2						
	SAMPLE TABLES											2				2						
	SAMPLE ILLUSTRATIONS											1				2						
	PREPARATION GUIDE															2						
READABILITY COMPREHENSIBILITY	JOB RELEVENCY	2						2				2				2						
	INFORMATION COMPRESSION							2				2				2						
	LEVEL OF WRITING	1	1						1	1		1	1				1					
	STYLE OF WRITING		2						1	2		1	2				2					
	READABILITY REQUIREMENTS																					
	VOCABULARY GUIDE																					
QUALITY ASSURANCE	QUALITY PROGRAM		2						B	2		2					2					
	IN PROCESS REVIEW											2										
	VALIDATION/VERIFICATION											2										
	VALIDATION OF READABILITY																					
	APPROVAL AND ACCEPTANCE		1							1		2					1					
	PREPARATION FOR DELIVERY		3	3						3	3		3	3			3	3				

rce Specification Systems (Ref. 63)

INSPECTION LUBRICATION AND MAINT CEM EQUIPMENT					OPN MAINT CKT DIAGRAMS ALIGN INSTL CEM EQPT					FIMM MANUALS CEM AND SUPPORT			OPERATION AND MAINTENANCE QRC EQUIPMENT						INTMD MAINT AVIONICS EQPT				INTMD MAINT AIRBORNE EQPT			OPN AND OP MAINT AUTOMN			CIVIL EQPT AND ACCESSORIES				OPN AND MAINT VARIOUS EQPT				MAINT AND OVERHAUL AUTOMOTIVE			
MIL-M-38777A	MIL-M-38784A	MIL-P-38790	MIL-M-83495	MIL-M-83931	MIL-C-9927A	MIL-C-38178A	MIL-M-38784A	MIL-P-38790	MIL-M-38769B	MIL-M-24100B	MIL-M-38784A	MIL-P-38790	MIL-M-8910A	MIL-M-38784A	MIL-P-38790	MIL-M-38807	MIL-M-83495	MIL-M-83931	MIL-M-25095A	MIL-M-38784A	MIL-P-38790	MIL-M-38799	MIL-M-25393A	MIL-M-38784A	MIL-P-38790	MIL-M-[illegible]	MIL-M-38784A	MIL-P-38790	MIL-M-38784A	MIL-M-38789A	MIL-P-38790	MIL-M-38807	MIL-M-38784A	MIL-P-38790	MIL-M-38797	MIL-M-38807	MIL-M-38784A	MIL-P-38790	MIL-M-38807	MIL-M-38812
2							2		2	2			2	2					2	2			2	2		2	2		2	2			2		3		2			3
	3						3			3				3						3				3			3		3				3				3			
		3		3				3		3					3			3			3				3			3			3			3				3		
		3						3		3		3			3						3				3			3			3			3				3		
3	3						3		3	3				3										3			3		3				3				3			
3	2						2		3	3			3	2					3	2			3	2		3	2		2	3			2		3		2			3
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	3						3			3	3			3						3				3			3		3				3				3			
	2						2			1	2			2						2				2			2		2				2				2			
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	C						C			1				C						C													C				C			
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2					3	3			2	2			1						2			A	2			2				2					2					2
										B						3																A				A			3	
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										1																														
										3																														2
	1						1			3				1						1				1			1		1				1				1			
	3	3					3	3		3				3	3					3	3			3	3		3	3	3		3		3	3			3	3		

LEGEND

1. VAGUE, INADEQUATE OR CONFUSING
2. ADEQUATE BUT SUBJECT TO INTERPRETATION
3. EXPLICIT

A. AS DIRECTED BY PROCURING AGENCY

B. AS STATED IN CONTRACT

C. IF REQUIRED BY PROCURING AGENCY

NOTE: Table shows the effectiveness of representative Air Force TM specification systems in providing Air Force TM requirements.

Table 8-8.—Requirements and Guidelines Documents for the Preparation of Job Performance Aids Format Options

	JPA Systems						Primary Formats																										
Requirements Document Number	AF FPJPA	FOMM	JGTOS	OMMS	SPA	WORKPAC	AAT	AIWP	AVUMM	FIM	FPTA	FRM	FRTM	FSV	FTPM	FTRV	GAEM	GSM	GVM	IGM	IWP	JGM(1)	JGM(2)	MIM	MSIM(1)	MSIM(2)	OMM	OTM	SOM	TCWP	WDM(1)	WDM(2)	ADAT
MIL D 1000																																	
MIL M 8910																																	
MIL M 008910A																																	
MIL C 9927																																	
MIL M 24100B		X											X	X	X	X																	
MIL M 38730	✓										✓									✓				✓	✓								
MIL C 38778																																	
MIL M 38784A	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
MIL P 38790	✓		✓	✓						✓	✓	✓					✓	✓	✓	✓		✓	✓	✓	✓	✓			✓		✓	✓	
MIL M 38799																																	
MIL M 38800A			X														X					X				X					X		
MIL M 63001																																	
MIL M 63004																																	
MIL M 63035					✓				✓																		✓	✓					
MIL M 63036					X																							X					
MIL M 63038					X				X																		X						
MIL M 63040					✓																												
MIL M 63043																																	
MIL M 63044																																	
MIL M 81203						✓		✓													✓									✓			
MIL M 81701B																																	
MIL M 81919																																	
MIL M 81927						X		X													X									X			
MIL M 81928																																	
MIL M 81929																																	
MIL M 83495				X						X		X						X	X				X						X			✓	
MIL HDBK 242		X											X	X	X	X																	
MIL HDBK 63038 1					X				X																		X						
MIL HDBK 63038 2					✓				✓																		✓						
MIL STD 863																																X	
AFHRL TR 73-43	X																			X				X	X								
AFHRL TR 79-49																																	
NAVAIR 00-25 700						X		X													X									X			

	Formats																																												
Requirements Document Number	APMCL	BFD	BLT	BSD	COP	DFMP	EOP	FID	FIP	FLD	ILI	IPBWP	ITST	JGIM(1)	JGIM(2)	JOBGUIDE(1)	JOBGUIDE(2)	JOBGUIDE(3)	LTTA	MDC(1)	MDC(2)	MFCP	MPWP	MRC	NLT	OMP	OPI	PEWP	PMCSP	POWP	SBD	SFD	SORP	SPTP	SUMP	TAT	TBD	TDC	TIMP	TLFD	TLT(1)	TLT(2)	TOCC	TSP	TTWP	URSTD
MIL D 1000																																														
MIL M 8910																																														
MIL M 008910A																																														
MIL C 9927																																														
MIL M 24100B		X		X						X										X				X										X									X			
MIL M 38730					✓											✓																				✓										
MIL C 38778																																														
MIL M 38784A	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓							✓	✓	✓						✓	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓
MIL P 38790					✓		✓		X					✓	✓	✓	✓				✓										✓					✓						✓				
MIL M 38799																					X										X															
MIL M 38800A														X			X				✓										✓							X				X				
MIL M 63001																																														
MIL M 63004																																														
MIL M 63035	✓		✓			✓		✓			✓		✓									✓			✓	✓	✓		✓			✓	✓		✓					✓	✓			✓		✓
MIL M 63036											X															X	X		X															X		
MIL M 63038	X		X			X		X					X									✓			X				X			X	X		X				X	X	X					X
MIL M 63040																																														
MIL M 63043																						X																								
MIL M 63044																																														
MIL M 81203												✓											✓					✓		✓															✓	
MIL M 81701B												✓																																		
MIL M 81919												✓																																		
MIL M 81927												✓											X					X		X															X	
MIL M 81928												✓																																		
MIL M 81929												X																																		
MIL M 83495							X		X						X			X																												
MIL HDBK 242		X		X						X										X				X										X									X			
MIL HDBK 63038 1	X		X			X		X					X									X			X				X			X	X		X				X	X	X					X
MIL HDBK 63038 2	✓		✓			✓		✓					✓									✓			✓				✓			✓	✓		✓				✓	✓	✓					✓
MIL STD 863																																														
AFHRL TR 73-43					X											X																				X										
AFHRL TR 79-49																			X																											
NAVAIR 00-25 700												✓											X					X		X															X	

X = Basic Requirement

= Specialized Requirement

✓ = Non JPA Requirement

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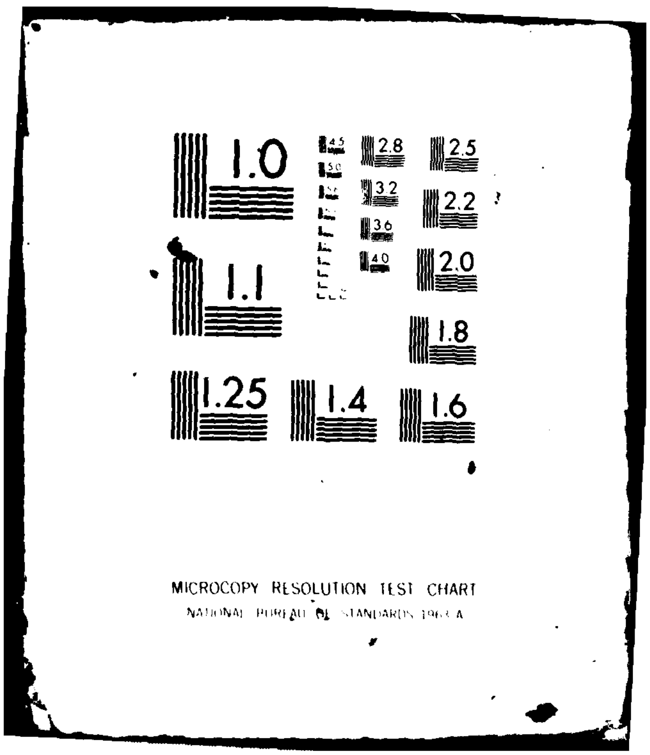
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